Chapter 5

TOWARD A MORE REFINED THEORY OF SCHOOL EFFECTS:

A Study of the Relationship Between Professional Community and Mathematics Teaching in Early Elementary School

(in Cecil Miskel and Wayne Hoy (Eds.), (2005), *Research and Theory in Educational Administration*. Greenwich, CT: Information Age Publishing.

Laura M. Desimone

ABSTRACT

This study uses nationally representative data from the Early Childhood Longitudinal Study (ECLS) to refine a theory of professional community. Specifically, the study examines how professional community influences mathematics instruction in kindergarten and first grade by (1) distinguishing structural from social-psychological aspects of professional community, (2) dividing structural aspects of professional community into leadership and interactive activities, and then (3) applying these distinctions to the theoretical underpinnings of a commitment and control framework in organization. Results support the hypotheses that collaboration and professional development foster more challenging instruction, and mediate the effects of leadership on instruction. There is little support for the hypothesis that social-psychological professional community mediates the effects of collaboration and professional development on instruction. Implications for theories about the relationship between professional community and instruction are discussed.

Introduction

School organization is a popular target for school change efforts, but our theoretical understanding of *how* school organization affects teaching and learning is limited. Empirical tests of hypothesized theoretical relationships are even rarer; but there is a body of work on teacher's professional community that has advanced our thinking about the links between the social organization of schools and teaching and learning. This study builds on that previous work and extends it in several ways.

First, the study integrates two theoretical perspectives—schools as social organizations and Brian Rowan's (1990) commitment and control framework—to study the relationship between professional community and teacher's use of conceptual instruction in mathematics. Second, the study refines and empirically tests a theoretical notion of how professional community works by dividing it into structural and social-psychological aspects, and by further dividing the structural aspects into leadership and interactive teacher activities. The theory set forth suggests that interactive activities mediate the relationship between leadership and ins truction, and that social-psychological sense of community mediates the relationship between structural aspects of professional community and teacher's instruction. The third extension is the testing of the theory on a nationally representative sample of students in the early grades (from the Early Childhood Longitudinal Study, http://nces.ed.gov/ecls), which is touted as one of the most effective points of intervention for at-risk students (e.g., Knapp, 1997; Shore, 1997; Slavin, Karweit, & Madden, 1989). This builds on previous foundational work that was primarily conceptual or conducted on case studies or localized samples, and focused on upper elementary, middle, or high school (e.g., Bryk et al., 1993; Louis & Marks, 1998).

A Social Organizational Perspective on Schooling

Moving from Coleman's (1966) and Jencks' (1972) seminal work showing weak school effects on student achievement, Sorensen and Hallinan (1977) arguably made the first attempt to conceptually link the effects of school and schooling with the process of learning. Their theoretical conception identified school effects as operating through opportunity to learn (Carroll, 1963), student aptitude, and student effort. Bidwell and Kasarda (1980) then elaborated on Sorensen and Hallinan's (1977) social organizational perspective on schooling by focusing on how relationships among social structure, resources, and individual attributes affect learning; one of Bidwell and Kasarda's (1980) influential views was that "formal organizational milieus" (for example, information flow, interpersonal relationships, working routines, and communication transfer) could affect the outcomes of schooling by ensuring teachers' conformity with the school's or district's instructional policy.

With grounding in these early theoretical ideas, scholars of schools as organizations called for studies to help explain how the organizational design of schools affects teaching and learning (Rowan, Bossert, & Dwyer, 1983). Barr and Dreeben (1988) were among the first to apply social organization theory to studies of schooling, showing how the organization of classroom instruction—the assignment, pace, and content of different reading groups, for example—affected student achievement in reading. Also pioneers in the study of schools, Bryk and Driscoll (1988) demonstrated the relationship of those aspects of teachers' work and relationships that could be considered components of Bidwell and Kasarda's (1980) "milieus" with teaching and learning. These lines of work fostered a major stream of research on professional community.

Professional Community

Bryk and Driscoll's (1988) and Rosenholtz's (1985, 1989) research was central to establishing the premise that professional community—broadly defined to include dimensions such as collaborative planning time, professional development, teacher decision making, shared goals, shared vision, teacher commitment, and sense of collective responsibility for student learning—can influence teaching and learning. Building on this work, Kruse et al. (1994) showed that positive school outcomes were related to specific aspects of professional community, particularly a collective focus on student learning, collaboration, teacher empowerment, and autonomy. Kruse and her colleagues separated what they considered conditions or precursors for professional community, such as communication structures, school autonomy, supportive leadership, trust and respect, and teacher decision-making, from characteristics of professional community, which they defined by such characteristics as a focus on student learning, deprivitization of practice and engaging in reflective dialogue (Louis & Marks, 1998; Louis, Marks, & Kruse, 1996; Louis, Kruse, & Associates, 1995).

Newman and Wehlage (1995) related student achievement to a similar conception of professional community, including the collective reinforcement of goals, clear shared purpose and responsibility for student learning, and engaging in collaborative activity. Lee and Smith (1996) also showed a link between student achievement and professional community, defined as collective responsibility for student learning, staff cooperation, and control over classroom and school work conditions.

Despite variation in how scholars operationalize professional community, the core idea seems consistent across studies: professional community represents leadership that is supportive of change, is focused on a clear vision for the school, and provides teachers with a role in decision making about the school and the classroom. Professional community also represents interactive, collaborative activities that require teachers to engage with each other around issues of curriculum and instruction, as well as positive social-psychological beliefs and attitudes towards teachers' work life, such as support, respect, and commitment.

Thus, a series of well-designed studies in the past two decades has demonstrated a link between professional community, in its various forms, and student achievement. This raises a major question: *How* does professional community influence student achievement?

One notion, for which there is some evidence, is that professional community influences student achievement indirectly through instruction (Creemers & Reezigt, 1996; Sorenson & Hallinan, 1977; Stringfield & Slavin, 1992). For example, Newman and Wehlage (1995) and Louis and Marks (1998) concluded that their measure of professional community had a positive relationship with student performance through teachers' increased use of "authentic" pedagogical strategies, such as having students construct knowledge and communicate their understanding of that knowledge.[1] Similarly, Taylor, Pearson, Clark, and Walpole (1999) found that in the context of teaching reading, teacher collaboration led to teaching in small groups, which fostered the use of more effective teaching strategies such as more engaging instruction—leading, in turn, to increased student achievement.

The idea that professional community impacts teachers' instruction is consistent with the research that has highlighted how teachers' work context shapes their use of instructional strategies and activities (Little, 1993; McLaughlin, 1994; Talbert & McLaughlin, 1993). Teaching is considered a complex task requiring high levels of skill and motivation, and an effective school organization capitalizes on a teacher's ability and motivation to improve performance (Rowan, 1994). In a continued effort to understand the influence of professional community, this previous empirical work leads to the question: How does professional community influence teaching?

Toward a More Refined Theory of the Effects of Professional Community on Teaching

To help answer this question—and in the process refine theory about links between professional community and the classroom—two research areas are bridged. First, current theoretical ideas that consider the broad, multidimensional nature of professional community are refined by dividing professional community into two components: structural aspects and social-psychological aspects. Structural aspects are then further divided into two dimensions, one related to leadership and the other related to interactive, collaborative teacher activities. Second, this newly created professional community dichotomy (i.e., structural vs. social-psychological) is bridged with Rowan's (1990) theory of a continuum of school organization—from commitment to control oriented—to suggest that challenging "conceptual" instruction is more likely to take place in schools high on professional community ("commitment" environments) than in "control"-oriented schools, which tend to focus on procedural instruction. The next section describes the evolution of these two approaches, and the hypotheses generated from bridging them.

Structural Aspects of Professional Development

For this theory-building exercise, structural aspects of professional community are considered to be those factors representing how a teacher's worklife is organized or structured. This includes the role of principals and teachers in leadership and decision making, as well as the form that teacher interactions take.

Leadership

Principal leadership. Key aspects of principal leadership that may help foster professional community include principals buffering teachers from outside pressures such as parents, districts, and resource issues; setting clear goals and following through on them; and providing a supportive environment for change (Firestone & Wilson, 1983; Little, 1982; Leithwood, Leonard, & Sharratt, 1998; Louis, Kruse, & Associates, 1995; Newmann & Wehlage, 1995; Rosenholtz, 1985, 1989). Buffering teachers from outside influences allows them to focus on instruction; setting clear goals allows them to develop coherent strategies around a particular target; and being supportive of change provides a safe environment for trial and error in trying out more complicated teaching strategies.

Teacher participation in decision making. Democratic approaches to leadership that involve teachers are characteristic of positive professional communities (Little, 1982; Newmann et al., 2001). Rosenholtz (1985, 1989) explains that one way teacher decision making may work to improve instruction is that the decision-making process moves teachers away from arbitrary or automatic reactions toward deliberate evaluation, suggestions, discussion, and modifications related to the nature and purpose of instruction. This is consistent with organizational theories that suggest including employees in the decision making allows performance to become more dependent on employee skills and motivation (Rowan, Chiang, & Miller, 1997).

Further, participation in decision-making about teaching fosters more confidence in teachers (Lee et al., 1991; McNeil, 1988; Mohrman et al., 1979; Newmann et al., 1989; Rosenholtz, 1989) and allows them to develop an increased sense of ownership regarding instructional goals—a key component to implementing instructional change (e.g., Datnow, 2000; McLaughlin & Marsh, 1978).

Interactive Activities

Leadership-related issues are only one component of the structural aspects of professional community. Another key aspect describes the structural arrangements that provide teachers with opportunities to collaborate and interact during professional development opportunities.

Collaboration. The opportunity to interact around instruction is a central component of professional community. More effective instruction may occur in schools where teachers engage in reflective discussion about their practice (Smith, Lee, & Newmann, 2001) and have an opportunity to collaborate (Rutter et al., 1979; Little, 1982; Newmann & Wehlage, 1995). Working with other teachers on lesson plans and curriculum allows teachers to share their ideas and pass along their successful experiences (Bird & Little, 1986). Such collaborations increase access to technical resources and expertise that can help teachers implement more challenging instruction; in other words, teacher collaboration may increase teachers' opportunity to learn (Kilgore & Pendleton, 1993). Collaborative work may also help teachers forge common goals, develop mutual respect for each other (Bird & Little, 1986; Rosenholtz, 1985), develop a sense of cohesiveness (Bridges & Hallinan, 1978), increase motivation and commitment (Newmann et al., 2001), and enhance their sense of mutual support for each other (Louis, Kruse, & Associates, 1995).

Professional development. In-service professional development activities can also be a productive form of teacher collaboration. Activities that provide teachers with an opportunity to observe or be observed, obtain feedback from other teachers, or work with other teachers in learning new content or pedagogical strategies can be powerful community-building mechanisms, as well as useful ways of increasing teachers' knowledge and skills (Bird & Little, 1986; Cohen & Ball, 1990a; Garet et al., 2001; McLaughlin & Talbert, 1993; Loucks-Horsley, Hewson, Love, & Stiles, 1998; Newmann et al., 2001). Such opportunities to learn from each other are crucial to teachers' efforts to successfully adopt reform-oriented practices such as conceptual instruction (Cohen & Ball, 1999) and have been shown to be related to increased use of such practices (Desimone et al., 2002).

Social-psychological Aspects of Professional Community

Next, the social-psychological aspects of professional community are considered. Unlike structural aspects, social-psychological aspects do not represent roles or actions; instead, the beliefs and attitudes of teachers—as reflected by, for example, shared vision, shared responsibility, and mutual respect—represent the social-psychological factors that are consistent with the idea of professional community.

Sense of community. The important social-psychological aspects of professional community are characterized by shared values, a shared sense of the school's mission, and mutual respect (Bryk et al., 1993; Cohen, 1988; Firestone & Rosenblum, 1988; Lee & Smith, 1996; McLaughlin & Talbert, 1999). Feeling respected and being part of a school with a shared mission can increase teacher commitment (Firestone & Pennel, 1993). A value consensus may not be related to better teaching, and may enforce traditional teaching standards (e.g., Anyon, 1981; McLaughlin & Talbert, 1993), but shared respect might also convey a feeling of unity and belonging among peers that counteracts the fragmentation of teachers' work and helps teachers manage the demands associated with more challenging types of teaching (Newmann, Rutter, & Smith, 1989).

Structural vs. Social-Psychological Aspects of Professional Community

While scholars have not explicitly divided professional community into structural and social-psychological aspects, the theoretical base and design of several important studies supports such a distinction. The structural features of professional community—such as shared decision making and collaborative planning—have been used to predict what is termed here as social-psychological aspects of professional community, including teachers coalescing around a shared vision and taking collective responsibility for student learning (Lee & Smith, 1995; Little, 1990; Louis, Marks, & Kruse, 1996; Newmann et al., 1995; Rosenholtz, 1985, 1989). Previous work has also used social-psychological aspects of professional community to predict teachers' instruction (Louis & Marks, 1998; Newmann & Wehlage, 1995) and conceptualized dimensions of support for professional community as either "structural" or "social and human resources" (Louis, Kruse & Associates. 1995). These studies have not, however, explicitly and systematically divided professional community into structural and social-psychological aspects in order to empirically examine their direct and indirect relationships with instruction.

Building on theory that links professional community to more challenging instruction, this study suggests how such links may operate. It is hypothesized that supportive, focused principal leadership and teacher decision making foster interactive professional development (i.e., activities where teachers actively interact) and other collaborative activities, in turn fostering positive social-psychological sense of community, which then directly influences teachers' capacity and choices about instruction and moves them toward covering more challenging content. Figure 1 illustrates the theoretical underpinnings of these relationships; the dotted lines represent current theory and the bold lines reflect the refinement that this analysis tests. Thus, in addition to hypothesizing direct relationships between professional community and teaching, which current theory supports, this analysis tests for mediating effects—specifically, that interactive, collaborative activities mediate the effect of leadership on teaching, and that sense of community mediates the effects of both leadership and interactive, collaborative teacher activities on instruction.

Linking the Structural/Social-Psychological Dichotomy with Rowan's Commitment and Control Framework

Previous theory provides a strong foundation on which to build a more detailed conceptual understanding of how professional community affects teaching. Specifically, Rowan (1990) applied structural contingency theory to schools, positing that the most appropriate organizational form depends on the kind of work an organization does. Rowan describes two main features of school organization on which schools may vary: (1) a "commitment" environment that fits the idea of professional community described earlier, where the school emphasizes shared responsibility for work, shared commitment to a common set of goals, lateral communication and shared power in decision making; and (2) a "control" environment where there is a clear hierarchy with top-down control and individualized (not collaborative) work. Most schools have aspects of both of these types of organization, but are usually stronger in one than the other. These two organizational forms have also been characterized, respectively, as "communal" and "bureaucratic."

Rowan (1990) suggests that the nature of teaching varies across these two organizational settings. Routine, clear-cut work—as represented by procedural, direct instruction techniques—is better managed with specialization and a clear hierarchy, while flexible, non-routine work—as represented by project-centered or conceptual teaching—is better managed with lateral, open communication. Conceptual approaches to teaching may result from communal organizational settings, or they may be the source of the communal organization (Rowan, 1995). For example, when faced with new and challenging tasks, teachers may be more likely to seek help from their colleagues. Based on these ideas, one would hypothesize that instruction characterized by direct, procedural content would be more likely to occur and more successful in a control-oriented school, whereas instruction characterized by conceptual content would be more common and more effective in a school with more of the "commitment" form (e.g., Bryk & Driscoll, 1988; Newmann & Oliver, 1976; Rowan, 1990).

Hypotheses

This study attempts to refine theoretical ideas about the relationship between professional community and teaching, as well as between organizational forms and teaching (Rowan, 1990), by (1) distinguishing structural from social-psychological aspects of professional community, (2) dividing structural aspects into leadership and interactive activities, and then (3) applying these distinctions to the theoretical underpinnings of Rowan's commitment and control framework.

The first hypothesis establishes the general relationship between instruction and professional community—specifically, that *the stronger the professional community, the more likely teachers are to implement conceptual approaches to instruction in the classroom.* This hypothesis is grounded in research that points to school structures and organizations as powerful mechanisms for shaping teachers' work lives and influencing their choices about both pedagogy and content (e.g., Elmore & Associates, 1990; Smith, Lee, & Newmann, 2001). To effectively use conceptual techniques, teachers must build their content knowledge—and they need support from their principal and fellow teachers as they undertake the risks, trial and error, and new learning required for conceptual teaching (e.g., McLaughlin & Talbert, 1993). Unless they feel a part of a strong professional community working toward a common goal, teachers may tend to maintain the individualism of their instruction and thus the status quo, which is predominantly procedural instruction.

The second hypothesis is that *structural aspects of professional community can be divided into leadership and interactive, teacher activities; interactive, collaborative activities mediate the effect of leadership on the extent to which teachers implement conceptual instruction in the classroom.* For example, in schools with supportive principals who establish a clear vision and where teachers have opportunities to participate in decision making, teachers are more likely to establish mechanisms to interact, such as collaborative work groups and joint planning. Through these joint planning and collaborative endeavors, teachers build their knowledge and skills, fostering an increased use of more challenging instruction in their classrooms. These relationships are illustrated in Figure 1. While the theory being tested hypothesizes a particular causal ordering, temporal antecedence cannot be determined from the data. Further, it is reasonable to consider that teachers with a proclivity to use conceptual approaches might foster a more communal type of professional community (e.g., Rowan, 1995). The potential nonrecursive relationship between teaching and professional community does not, however, interfere with the fundamental focus here on studying whether particular aspects of professional community are related to specific types of instruction.

The third main hypothesis is that *social-psychological aspects of professional community mediate the effects of structural aspects on the extent to which teachers cover challenging content.* For example, teachers foster a sense of shared vision and mutual respect via collaboration in planning the curriculum or in addressing the needs of individual students; this in turn motivates them to build their knowledge and skills and provides them with the support they need to increase their use of challenging content in the classroom.

Mathematics Instruction

This study focuses on mathematics, a subject targeted in the federal *No Child Left Behind Act of 2001* and used as an international benchmark for the relative standing of U.S. students (e.g., Schmidt, McKnight, & Raizen, 1997; Stevenson & Stigler, 1992; Stigler & Hiebert, 1999). Evidence suggests that teacher practices differ by subject area (Stodolsky & Grossman, 1995), which supports the separate study of teaching practices by subject.

Rather than attempt to define instruction in all its depth and complexity (Cohen, Raudenbush, & Ball, 2003; Good & Brophy, 2000), this study instead focuses on one aspect of instruction: content, which is defined to include topics (e.g., counting, time) and type of learning required (e.g., memorization, communicating understanding). This choice is based on a pragmatic need to develop a measurable definition of instruction, as well as evidence that the content of instruction has thus far proven a stronger predictor of student achievement than pedagogical techniques have (e.g., Barr & Dreeben, 1983; Cooley & Leinhardt, 1980; Pellegrino, Baxter, & Glaser, 1999; Porter et al., 1993; Rowan & Miracle, 1983).

The distinctions between types of instruction used in this paper are grounded in the mathematics reform literature of the past two decades that focuses on the difference between "procedural" and "conceptual" knowledge, and suggests an increased emphasis on conceptual instruction is a potentially powerful strategy for increasing student achievement (see Loveless, 2001).

Reformers argue that the prevailing view of mathematics that has dominated K-12 education has involved mostly rules and procedures (Goodlad, 1984; Stake & Easley, 1978), with a focus on computational and algorithmic procedures that involve following predetermined steps to compute correct answers (Romberg, 1983). Student learning goals are usually memorization, recitation, and demonstration of facts, definition, and procedures (Smith, Lee, & Newmann, 2001).

In contrast, “conceptual” teaching in mathematics—also called “higher-order instruction,” “teaching for understanding,” and “authentic teaching”—is advocated by many reforms (see Carpenter, Fennema, & Franke, 1996; Cohen & Ball, 1990b; NCTM, 1989; Spillane & Zeuli, 1999). Advocates state that through reasoning and argument (Lampert, 1992), as well as through conversations about mathematics, students learn from one another and gain insights that are not possible through procedural techniques (Brown & Campione, 1990; Brown, Collins, & Duguid, 1989; Simon, 1986). Conceptual teaching is often characterized as focusing more on higher-order thinking, such as synthesizing, estimating, explaining, hypothesizing, engaging in substantive conversation, and making connections to everyday situations than on simple manipulation of numbers to compute the right answer (Ball, 1993; Cobb, 1988; Lampert, 1986; 1990; Ma, 1999; NCTM, 1989, 1991; Newmann et al., 1995; Schifter & Fosnot, 1986)— for example, understanding the idea of place value, rather than just memorizing “where the decimal goes.”

Debates persist about the appropriate balance between conceptual and procedural instruction in mathematics; it has not yet been determined which mix of content with which students has what effect over what duration of time under what circumstances (see Gamoran, Secada, & Marrett, 2000; Loveless, 2001; Shouse, 2001). However, many studies have documented achievement benefits from increased use of conceptual techniques in mathematics, using different definitions of conceptual instruction, and studying different grade levels (e.g., Carpenter et al., 1989; Cobb et al., 1991; Gamoran et al., 1997; Hiebert et al., 1996, 1997; Silver & Lane, 1995; Lee, Smith, & Croninger, 1997). Research also shows that conceptual techniques might be especially beneficial to disadvantaged students (e.g., Knapp, Shields, & Turnbull, 1992; Smith, Lee, & Newmann, 2001). Some studies, though, offer evidence in support of an emphasis on direct, procedural instruction (e.g., Geary, 2001; Slavin et al., 1990).

This study does not intend to contribute to the debate on the relative importance of conceptual versus procedural instruction. The decision to focus on conceptual instruction is based on evidence that (1) most mathematics students in the United States receive predominantly traditional, procedural instruction in mathematics (Hiebert, 1999; Schmidt, McKnight, & Raizen, 1997), and so there is no need to increase the use of procedural instruction; (2) compared to their high- and mid-achieving counterparts, low-achieving students receive less conceptual and more procedural instruction on average (Knapp & Shields, 1990; Kozma & Croninger 1992; Levine, 1988; Smith, Lee, & Newmann, 2001); and (3) most reformers advocate for at least a balance of procedural and conceptual instruction (Gamoran et al., 1997; Mullis, 1997; Smith, Lee, & Newmann, 2001), if not more of an emphasis on conceptual.

Method

Data

The study uses data from the National Center for Education Statistics' (NCES, 2000) Early Childhood Longitudinal Study (ECLS), a nationally representative longitudinal sample of students who were kindergartners in 1998. The kindergarten sample is based on a national sample of schools with kindergarten programs. Because the ECLS followed students, teachers and schools were sampled in the first grade only if they included one or more ECLS-K children in their classrooms (NCES, 2004).

The ECLS' nested design of students in classrooms in schools, as well as its multidimensional measures of professional community and teaching, make it a good resource for testing the theoretical propositions presented here. The ECLS currently provides two years of data on a national multistage probability sample of 19,000 kindergarteners and first graders in 3,000 classrooms in 1,000 schools (the public-use third-grade student achievement data became available in the summer of 2004). The ECLS conducted teacher surveys (93% response rate), principal surveys (69%), and parent interviews (85%) each year (NCES, 2000).

This study examines kindergarten and first grade teachers within schools using teacher and principal surveys from the "restricted-use" version of the ECLS. These data allow the linking of students to classrooms and schools. Since initial analyses of separate kindergarten and first-grade samples showed very similar results, and theory does not suggest that professional community would work differently in different early elementary school grades, the sample was pooled. Teacher-level variables are calculated from teacher questionnaires and classroom averages of student characteristics; school-level characteristics are calculated from administrator surveys and school averages of student characteristics. After choosing teachers with complete data on instruction, a total of 4742 teachers and 969 schools are included in the analysis.

The Quality of Survey Data

The variables in this analysis are taken from teacher self-report surveys. As with every type of data collection, surveys have limits; however, careful examination of the research literature offers support for the use of surveys to measure instruction and other school-related activities. For example, the problem of teachers being inclined to answer in socially desirable ways (Burstein et al., 1995) is less of a problem with anonymous surveys than in focus groups or interviews where they are in a more public forum (Aquilino, 1994, 1998; Dillman & Tarnai, 1991; Fowler, 2002). Also, when survey questions do not seek judgments of quality but rather accounting of behaviors, as the instruction questions on the ECLS do, social bias decreases and the validity and reliability of teacher self-report data can be quite high (Mullens & Gayler, 1999; Mayer, 1999).

Research has also shown that survey measures of teaching—especially composite measures like the ones used in this study—are effective in describing and distinguishing among different types of teaching practices and how often they are used, though not in measuring dimensions of teaching such as teacher-student interaction and teacher engagement (Herman, Klein, & Abedi, 2000; Mayer, 1999; McCaffrey et al., 2001). Further, several studies have shown that teacher self-report surveys are highly correlated with classroom observations and teacher logs, and that one-time surveys about the content and strategies that teachers emphasize are quite valid and reliable in measuring teachers' instruction (Mullens, 1995; Mullens & Gayler, 1999; Mullens & Kasprzyk, 1996, 1999; Schmidt, McKnight, & Raizen, 1997; Shavelson, Webb, & Burstein, 1986; Smithson & Porter, 1994). The proper use of survey data to measure instruction also includes clarifying effect size claims and avoiding claims of causality from nonexperimental survey data (e.g., Rowan, Corenti, & Miller, 2002), both of which this study does. Further, surveys are considered appropriate for estimating a range of instructional approaches and providing estimates of their relationships with other key school and student-level variables (e.g., Cohen, Raudenbush, & Ball, 2003; Raudenbush, Rowan, & Cheong, 1993). While the ECLS survey data are limited in depth, they provide a good opportunity to test in a national sample the relationships that smaller studies have found between professional community and instruction.

Measures

The structural aspects of professional community are measured by three variables that represent leadership—supportive, focused principal leadership, teacher decision making about the school, and teacher decision making about the classroom—and two variables that represent teacher interactions—teacher collaboration and interactive professional development opportunities. The social-psychological aspect of professional community is measured by a variable that represents sense of shared mission and mutual respect. Table A1 in the appendix describes each measure in the analysis and provides the alpha reliability of each composite of 3 or more items. Table 1 provides the standardized mean, standard deviation, and minimum and maximum value for each of the main independent and dependent variables.

Most of the variables are composite measures comprised of several items. Composites were developed based on the literature, then tested through confirmatory factor analysis to ensure that the items in each composite were measuring the same latent construct. Each professional community variable is measured at the teacher level, to account for the reality that there is substantial within-school variation on professional community (e.g., Newmann, King, & Youngs, 2000; Rowan, Chiang, & Miller, 1997).

Control Variables

Teachers' experience, knowledge, and skills have been associated with their ability and proclivity to use conceptual approaches to teaching (Ball, 1991; Putnam & Borko, 1997), and have been identified as mediators of the relationship between school organization and instruction (e.g., Cohen & Ball, 1990a, 1999; Louis & Marks, 1998). Thus, the analysis controls for teachers having a bachelor's or higher degree in mathematics, the number of mathematics courses taken in college, type of certification, years of experience, and whether teachers are in their first or second year of teaching. Further, there is evidence to suggest that teachers use conceptual approaches more often with higher-achieving students and procedural approaches more often with lower-achieving students (e.g., Smith, Lee, & Newmann, 2001; Snow, Burns, & Griffin, 1998; Turnbull et al., 1999), so student achievement at the start of the school year is controlled to help account for any variation in teachers' instruction that might be due to their responses to the class's achievement background. The amount of time in school (full-day Kindergarten) and the time spent on math instruction are also controlled.

School- and class-level demographic factors are correlated with the features of professional community (e.g., McLaughlin & Talbert, 1993), as well as with different types of instruction (Knapp, Shields, & Turnbull, 1992)—so the analysis controls for school poverty (free and reduced price lunch), percent minority students (Black or Hispanic) students in the class, and the percent of LEP and special education students in the class.. In addition, because professional community has been associated with small schools (e.g., Lee & Smith, 1996) and research suggests private schools have different selection, organization, teacher, and community characteristics (Coleman, Hoffer, & Kilgore, 1982), the analysis controls for school and class size and whether the school is private or public. Finally, since instruction is expected to become more challenging in later grades, the analysis controls for class level (i.e., kindergarten or first grade).

Instruction

Teachers' instruction is dynamic and complex (e.g., Cobb et al., 1992, 2001; Good & Brophy, 2000; Lehrer, Lee, & Jeong, 1999). While there are certainly many nuances not captured in this analysis, the measures used have adequate construct, face, and predictive validity; the composites are sufficiently reliable (with alpha reliabilities from .60 to .87); and the measures are consistent with the literature in terms of distinguishing topics and cognitive demands at increasingly challenging levels for early mathematics learners (e.g., Clements & Sarama, 2004). As such, the measures are instructive for the goal of this study: to test a relationship between professional community and increasingly challenging instruction. Though using alternative and more complex notions of challenging content and other important dimensions of instruction such as teacher-student interactions (Cohen, Raudenbush, & Ball, 2003) is beyond the scope of this study, such investigations would be a natural follow-up to the work reported here.

Reasonable dimensions of the content of instruction were derived from the literature on mathematics teaching and learning described earlier, standards for high-quality early elementary mathematics education (Clements & Sarama, 2004), descriptions of the "average" content taught in kindergarten and first grade (e.g., Denton & West, 2002), and consultation with nationally recognized experts in early mathematics. Based on a synthesis of this information, the ECLS measures of instruction were divided into four categories in order of increasing focus on more challenging content: basic, algorithmic, relational, and conceptual. Confirmatory factor analysis was conducted to check the validity of the constructs. Details on how each measure is constructed are in the appendix.

Relative amount of conceptual instruction. The expectation is that most teachers teach a substantial amount of basic instruction in both kindergarten and first grade, and a substantial amount of algorithmic instruction in first grade; so the hypothesis testing here should focus on how well professional community variables predict conceptual (and relational) teaching, with basic and algorithmic teaching as comparison points. This is a reasonable approach, but it assumes that teachers have to "trade off" time spent on one type of content with time spent on another; for example, more time on conceptual instruction would mean less time on basic instruction. However, the ECLS survey questions do not ask teachers to account for 100% of their instructional time with each of the four types of instruction; instead, teachers indicate how many times a day/week/month they cover particular content, which does not force trade-offs.

The descriptive data was examined to suggest the extent to which trade-offs were being made. Correlations of the four different dimensions of instruction described above range from .44 to .68 (see Table 2); further, comparisons of scatterplots of each type of instruction reveal only small tradeoffs (see Figure A1 in the appendix). An examination of the mean for each type of instruction for low, medium, and high levels on each of the professional community variables (see Table A1 in the appendix) indicate that basic instruction is the most common, conceptual is the least common, and as values of professional community increase, teachers do more conceptual instruction.

A new instruction variable was created to test the sensitivity of results to the trade-off assumption. To "control" for possible high levels of other types of instruction when predicting conceptual instruction, an additive dependent variable was created. As instruction becomes more challenging, the weight increases. So, the weight for basic=1, algorithmic=2, relational=3, and conceptual=4. In effect, this variable measures the relative amount of conceptual teaching, given the amounts of other types of teaching. The empirical reasonableness of this “hierarchy” of types of instruction is supported by the HLM (hierarchical linear modeling) results for the control variables (reported in Tables 3, 4, and 5). For example, as classroom mean achievement and teachers’ content knowledge (as measured by number of mathematics courses taken) increases, teachers are more likely to use relational and conceptual approaches.

The original response categories for all types of instruction were 1=never, taught at a higher grade level, or children should already know; 2=once a month or less; 3=two or three times a month; 4=once or twice a week; 5=three of four times a week; and 6=daily. For ease of interpretation, the instruction variables and the collaboration variable—which is on the same scale—are converted to frequency per month (assuming 4.3 weeks per month given 52/12=4.3). Thus, the new scale is 1=0 times per month; 2=1 time per month; 3=2.5 times per month; 4=6 times per month; 5=15.16 times per month; and 6=21.6 times per month.

Analysis

Three models are used to test the three main hypotheses. All three models test the first hypothesis: that all types of professional community are associated with increased use of conceptual and relational instruction. The first and second models test the second hypothesis: that interactive activities mediate the effects of leadership on the extent to which teachers use conceptual instruction. To test this hypothesis, the first model regresses the five different measures of instruction—basic, algorithmic, relational, conceptual, and relative amount of conceptual—on (1) school and teacher-level measures of supportive, focused leadership, and (2) school- and teacher-level teacher participation in school and classroom-level decisions. This analysis provides evidence of the extent of the direct relationship between aspects of leadership and instruction. The second model then adds the interactive activities—

collaboration and interactive professional development—to the estimation. If the size and/or significance of the leadership variables decreases significantly from the first to the second model, this will suggest that part of the effect of leadership on instruction is mediated through interactive teacher activities.

The third model tests the third hypothesis that the social-psychological aspects of professional community mediate the effects of the structural aspects. So, in the third model, the variable measuring social-psychological aspects of professional community is added to the estimation; if the coefficients for leadership or interactive activities decrease or lose their significance, this is an indication that social-psychological aspects of professional community mediate the relationship between structural aspects of professional community and instruction.

All analyses were conducted using hierarchical linear modeling (HLM), which separately estimates coefficients for each level of the system (i.e., school and teacher). This method reduces the aggregation bias inherent in regression models that use variables at different levels in the same equation (Bryk & Raudenbush, 1988). The multi-level modeling technique used here "is an elegant method for examining differences between groups in individual-level effects" (Gamoran, Secada & Marrett, 2000), but does not address causal ambiguities; suggestions about causal ordering are derived from previous work. A longitudinal sample of teachers (ECLS follows students, not teachers) would be more appropriate for identifying temporal antecedents to teachers' instruction; such a study would also be able to address how the instability of instruction may influence results (Cohen & Ball, 1999). Still, the analysis here can provide a solid foundation for refining ideas about professional community, especially given the nature of the national sample.

In the analysis, school is level 2 and teachers are level 1. A random intercepts model was used at both level 1 and level 2. Mean substitution is used for missing data on the independent variables; dummy variables were created to flag variables for which were missing, and these dummy variables were then entered into the model to indicate whether missing data introduces bias in the results. Cases with missing data on the dependent variables were dropped. To check the sensitivity of the results to substituting the mean for missing values, the multiple imputation method was also used. Because results from the multiple imputation analysis were nearly identical to the mean substitution results in terms of significance (a few of the coefficients were 10-15% larger in the mean substitution), the results of the more straightforward method of mean substitution are reported.[2]

Results

Table 2 contains the correlations of the main independent and dependent variables in the study. With the exception of the two teacher decision-making variables, all professional community variables are significantly correlated with types of instruction. These correlations forecast later findings from the multi-level models that the two teacher decision-making variables are the weakest predictors of instruction. On the whole, the correlations show that multicollinearity between the independent and dependent variables is not a concern.

Consistent with prior research (e.g., Bryk & Raudenbush, 1988), the variance decomposition (see Tables 3, 4 and 5) shows more within- than between-school variation in professional development and teaching. The models explain between 10 and 17 percent of the between-school variance in different types of instruction.

Hypothesis 1: Professional community fosters teachers' use of challenging content in the classroom.

As mentioned earlier, examination of the means for each type of instruction by low, medium, and high levels of professional community (reported in Table A1 in the appendix) provide support for the idea that more challenging instruction is more common in schools with higher levels of professional community. In fact, Table A1 shows that use of all types of instruction increases as professional community increases. Higher levels of professional community are often associated with more of an increase in conceptual than other types of instruction, but differences between types of instruction are generally not statistically significant.

Moving from this precursory mean analysis to the HLM analysis predicting instruction (reported in Tables3, 4 and 5), results show that some, but not all, structural and social-psychological aspects of professional community predict the increased use of conceptual instruction. Results also indicate that professional community variables predict other types of instruction, though often at weaker levels. In Model 1 (Table 3), teacher-level supportive, focused principal leadership predicts a .27 ($p<.001$) standard deviation increase in algorithmic instruction, compared to a .49 ($p<.001$) standard deviation increase in conceptual instruction—a statistically significant difference. Translating these coefficients into a more interpretable metric, when supportive, focused principal leadership changes from 3.97 (about "agree") to 4.92 (about "strongly agree"), there is a corresponding increase in algorithmic teaching of one fourth of a day each month ($b=.27$),[3] compared to almost half a day's increase in conceptual teaching per month ($b=.49$).

Supportive, focused principal leadership also predicts a .38 ($p<.001$) standard deviation increase in basic instruction, which is not statistically different from its predictive power for conceptual. In Models 2 (Table 4) and 3 (Table 5), supportive, focused leadership predicts more of an increase in the more conceptual than procedural types of instruction, but the differences are small. School-level decision-making is insignificant in model 1 (Table 3), but is associated with decreased use of all types of instruction except algorithms in models 2 (Table 4) and 3 (Table 5). Classroom-level teacher decision-making variables are insignificant across all of the models.

As expected, teacher-level collaboration and professional development generally are stronger predictors of conceptual and relational than basic and algorithmic, though differences are quite small. For example, collaboration predicts a .98 ($p<.001$) standard deviation increase in conceptual and a .92 ($p<.001$) standard deviation increase in relational teaching, compared to a .70 ($p<.001$) and .59 ($p<.001$) standard deviation increase in basic and algorithmic instruction respectively. Translating these coefficients into a practical metric, an increase from 2.99 to 4.19 in the number of days per month spent collaborating—basically an increase of one day per month—corresponds to an increase of a little less than one day per month of conceptual (.98) and relational (.92) teaching, about ¾ of a day per month of basic instruction (.79) and about half a day's increase in algorithmic teaching (.59).[4]

This pattern is similar for teacher-level professional development and holds true for Model 3, when social-psychological professional community is added. In several cases, interactive professional development does a significantly better job of predicting conceptual than basic; for example, in both Models 2 and 3 (Tables 4 and 5), interactive professional development predicts a .73 ($p<.001$) standards deviation increase in basic instruction, compared to a .87 ($p<.001$) increase in conceptual instruction. This translates into an increase in professional development from 1.4 days per month to 1.87, corresponding to an increase of .73 days per month in basic instruction and an increase of .87 days in conceptual instruction.[5]

As for the direct relationship between social-psychological professional community and the different types of instruction, Model 3 shows that controlling for the structural aspects of professional community, social-psychological aspects predict a .09 ($p<.05$) increase in relational instruction, and a .17 ($p<.05$) standard deviation increase in relative amount of conceptual instruction (relationships with basic and conceptual instruction are only significant at the .10 level). This means that an increase in social-psychological community from "agree" to "strongly agree" predicts an increase of about one fourth of a day more relational teaching and one fifth of a day more relational instruction and relative amount of conceptual instruction per month. These effects are weaker than for professional development and collaboration. Sense of community is a much weaker predictor of instruction than supportive, focused leadership, interactive professional development, or collaboration.[6]

Hypothesis 2: In considering the structural aspects of professional community, *interactive, collaborative activities mediate the effect of leadership on increasing teachers' use of challenging content in the classroom*.

Comparing Tables 3 and 4 shows that interactive, collaborative activities have direct relationships with instruction, and they also mediate the relationship between all types of instruction and supportive, focused principal leadership and school-level decision-making. Specifically, relationships between supportive, focused principal leadership and all types of instruction decrease moderately when the interactive activities variables are added to the model. For example, teacher-level supportive, focused principal leadership goes from predicting a .49 (p<.001) standard deviation increase in conceptual instruction and a .42 (p<.001) standard deviation increase in relative conceptual instruction in Model 1 to predicting only a .38 (p<.01) standard deviation increase in conceptual instruction and .33 (p<.001) increase in relative conceptual instruction in Model 2. The relationships with algorithmic and relational instruction also decrease when collaboration and interactive professional development are added.

The school-level decision-making variables that did not predict instruction in Model 1 (Table 3) become significant negative predictors when interactive activities are added in Model 2 (Table 4). It could be that once professional development and collaboration are controlled, the more school decision-making becomes a proxy for having a leadership role at the school, which results in teachers spending less time on instruction.

Hypothesis 3: ***The social-psychological aspects of professional community mediate the effects of structural aspects of professional community on teachers' use of challenging content.***

The third hypothesis can be examined by comparing Models 1, 2, and 3 in Tables 3, 4, and 5. Results suggest that social-psychological aspects of professional community may mediate the effects of supportive, focused leadership, but not the effects of school-level decision making, collaboration, or professional development.

The addition of social-psychological aspects of professional community to the estimation reduces the predictive power of supportive, focused principal leadership for all types of instruction, especially relational and relative amount of conceptual, only negligibly (by .02 or less). Interactive professional development and collaboration remain basically unchanged. Thus, in this analysis, instruction and social-psychological aspects of professional community mediate the relationship between instruction and supportive, focused principal leadership but not the relationship between instruction and school-level decision-making or instruction and interactive collaborative activities.[7]

Discussion

Though most of the effect sizes in this analysis are small (see Rosenthal & Rosnow, 1984), there are some effects of moderate practical size—for example, a one day per month increase in collaboration results in a one day per month increase in conceptual teaching. In addition, since only about 10-20% of the variance in instruction is due to school-related variables, the coefficients here that explain between 25% to a full standard deviation change in teaching are substantial enough to suggest a meaningful relationship, adequate for drawing tentative conclusions about the theory being tested.

A sophisticated understanding of the relationship between school- and classroom-level factors acknowledges that there are most likely important bi-directional, indirect, and interactive effects (e.g., Cohen & Ball, 1999; Cohen, Raudenbush, & Ball, 2003; Elmore, Peterson, & McCarthey, 1996; Sorensen & Morgan, 1999; Gamoran, Secada, & Marrett, 2000). Competing theories hypothesize that teaching may drive organization instead of the other way around (e.g., Elmore, Peterson, & McCarthey, 1996; Rowan, 1995; Rosenholtz, 1985), given that teaching practice is to a large extent shaped by teachers' prior ideas and teaching behaviors (also Cohen, 1990; Cohen & Hill, 2000). Unfortunately, bi-directionality cannot be examined, since the study does not follow teachers over time. It is noted that a longitudinal study would provide a natural follow-up to the current analysis, and the possibility of nonrecursive and interactive effects should be considered in the interpretation of the results. Also, unmeasured variables may explain part of the professional community effects; for example, the effect might be partly explained if schools high on professional community were also more likely to offer rewards, or have explicit policies about instruction.

Interpretation of Findings

Results offer some support for the first two hypotheses. Findings support the first hypothesis, that professional community fosters more challenging instruction, but more generally, professional community supports all types of instruction; class-level decision-making was the only professional community variable that never significantly predicted instruction. The second hypothesis was that structural aspects pertaining to leadership operate primarily through their relationship with fostering teacher interactions and positive social-psychological community. Findings show that interactive and social-psychological aspects of community do explain some (but not all) of the relationship between leadership and instruction. But there is little support for the third hypothesis, that those structural aspects of professional community representing teacher interaction have part of their effect through the social-psychological aspects of professional community.[8]

Some but not all aspects of professional community predict more conceptual instruction. Results of this analysis support the idea that teachers are more likely to cover more challenging content in the classroom if they work in an environment where the principal is supportive and has a clear vision for the school, and where they interact with other teachers—observing, receiving feedback, and engaging in dialogue about instructional practices—to plan and strategize collaboratively (e.g., Smith, Lee, & Newmann, 2001). In other words, "commitment"-oriented environments are more likely to have more challenging instruction (Rowan, 1990)—but teachers in this study in commitment –oriented schools are also more likely to spend time on procedural instruction.

In the current analysis, findings suggest that teacher decision making does not have a direct relationship with instruction, but may work indirectly through teacher interactive activities. Decision-making about school-level policy was negatively predictive of most types of instruction when interactive activities were included in the analysis. Supplemental analyses show that teacher decision-making has a small but significant relationship with both interactive professional development and collaboration. These results may suggest that in schools where teachers have more decision-making authority, they may be more likely to design and participate in professional development activities that require collaboration and interaction, which themselves have a direct positive relationship with the use of more challenging instruction (as well as procedural instruction).

Class-level decision-making is never a significant predictor of instruction. These results are consistent with earlier work suggesting teacher decision-making is not sufficient for establishing professional community (Louis & Marks, 1998), and that it has either a weak or no direct association with instruction (e.g., Conley, 1991; Lee & Smith, 1996; Malen, Ogawa, and Kranz, 1990; Murphy & Beck, 1995; Newman, Rutter, & Smith, 1989). One hypothesis is that involvement in school-level policy setting is distracting to teachers, since it often is not directly related to classroom teaching (Johnson, 1990).

Interactive, collaborative aspects of professional community mediate the effects of principal leadership on instruction. The relationship between a principal's supportive, focused leadership and teachers' instruction becomes smaller when collaboration and interactive professional development and are added to the estimation model. This provides support for the initial theoretical notions set forth here—that structural aspects of professional community can be divided into leadership and interactive, collaborative activities, and that leadership's effects on instruction are mediated by the actual activities in which teachers engage. Results offer some support for the hypothesis that the reason supportive, focused leadership might facilitate more challenging instruction is in part because such leadership involves the creation of organizational structures that allow teachers to interact with each other around curriculum and instruction (according to Rowan, 1990, a more "commitment"-oriented environment is more likely to have opportunities for teachers to work with each other). This in turn builds the knowledge and skills teachers need to implement more challenging instruction, and also increases their motivation and commitment to implementing such instruction (e.g., Datnow, 2000). However, even after adding interactive activities, supportive, focused principal leadership has an independent positive relationships with all types of instruction, indicating that teacher interactions do not explain all of the effect of leadership.

Social-psychological professional community mediates supportive, focused principal leadership, but not collaboration or interactive professional development. These findings are consistent with the view that teachers' opportunity to learn, such as in collaborative planning and interactive professional development, is crucial to improving their instructional capacity (Cohen & Ball, 1999; Smith, Lee, & Newmann, 2001).

Previous views that collegial interactions contribute to a strong feeling of belief in community, making teachers more focused and thus more effective (Little, 1982; Meyer & Cohen, 1971; Rosenholtz, 1985) could still be true. It could be that certain aspects of social-psychological professional community are more important than others, for example, collective responsibility for student learning, which was not measured in this analysis. Also, sense of community perhaps has its influence through teacher efficacy, or through behaviors consistent with teacher commitment—such as increased teacher attendance and retention—which are beyond the scope of this analysis. It would be instructive to further explore how other variables might mediate the relationship between sense of community, instruction, and student achievement.

While results generally support a positive relationship between professional community and more challenging instruction, results differentiating the four forms of instruction are not as strong as the theory anticipated. This is probably due in part to the modest correlation among the four dependent variables and to the complexities involved in trying to distinguish four separate content levels of instruction in a multi-grade analysis (e.g., the algorithmic variable is more advanced for kindergarten than first graders). To some extent the inclusion of the weighted variable that measures amount of conceptual instruction relative to other types of instruction accounted for these challenges.

But the findings also suggest another hypothesis, appealing for its relevance to this theory-building exercise: that some of the influence of professional community, especially in disadvantaged schools, could be to focus teachers on instruction—any type of instruction—and away from discipline, paperwork, and other non-academic concerns. Nearly two decades ago, Brophy and Good (1986) pointed out the importance of teachers focusing on any type of instruction versus not actively teaching at all. This would explain why the professional community variables are significant predictors of basic and algorithmic as well as relational and conceptual instruction. Such a notion is consistent with the proposition set forth by Lee, Smith, and Croninger (1997) in their analysis of high-school organization. They suggested that school organization might have its effect not only on individual teacher practice, but through a "willingness of schools to adopt and stick to policies and practices that move them away from bureaucracies toward communities with a strong academic focus" (p. 141). Thus, it could be that much of the power of strong professional community is not only to foster more challenging instruction, but to move teachers away from spending time on non-academic concerns so they can focus on instruction.

Future Directions for Research

The analysis here provides support for Rowan's (1990) application of contingency theory to schooling, which establishes the importance of organizational commitment strategies for mediating the effectiveness of professional community on teachers' instruction. The next step in developing an even more refined theory of how professional community affects teaching and learning is to apply Rowan's view that organization improves the *effectiveness* of particular teaching practices; that is, to examine the extent to which professional community influences the *effectiveness* of instruction on student achievement. Such a study might examine the extent to which conceptual teaching is more strongly linked to student achievement in schools with strong professional community (commitment-oriented) than in control-oriented schools. This line of work would also be informed by analyses that model structural/organizational interactions with teaching (Lee & Bryk, 1989); and a study of a longitudinal sample of teachers would be an appropriate way to help tease out the time-ordering (e.g., Rogosa, 1995).

A strength of this study is that it focuses on kindergarten and first grade, at a time when more and more research is showing the importance of good teaching in the early grades (Snow, Burns, & Griffin, 1998). However, the relationship between professional community and instruction might differ in later elementary grades; examining these relationships in a national upper-elementary sample with multiple conceptions or dimensions of professional community would also be informative. Further, research should continue to be sensitive to the finding that teachers within the same school have different experiences in terms of professional community.

Conclusion

In seeking to refine a theory of how professional community influences teaching, this study of kindergarten and first grade suggests that (1) conceptual instruction is more likely to occur in schools with supportive, focused leadership, teacher collaboration and interactive professional development; this is consistent with Rowan's (1990) hypothesis that conceptual teaching is more likely in commitment-oriented schools; (2) collaboration and interactive professional development mediate some but not all of the relationship between supportive, focused leadership and conceptual teaching, and (3) social-psychological professional community mediates some but not all of the relationship between supportive, focused principal leadership and instruction, but does not mediate the relationship between collaboration and professional development and instruction.

Developing a more detailed theoretical view of how professional community influences teachers' use of particular types of instruction has the potential to help us better understand the links between schools and classrooms. Refining our conceptions of how schools work can serve as a theoretical foundation for modeling and testing efforts to improve and equalize teaching and learning for all students.

Notes

1. As described in Newman, Marks, and Gamoran (1996), authentic pedagogy is defined as instruction that requires (1) the construction of knowledge; (2) disciplined inquiry (which includes building on the student's prior knowledge base, requiring demonstration of an in-depth understanding. and elaborated communication; and (3) the material to have value beyond school.

2. Though mean substitution produces unbiased estimates of coefficients in regression analyses if the data are missing at random, it does lead to lower estimates of standard errors (Allison, 2001). Multiple imputation permits estimates of all cases, even missing data on the dependent and independent variables. This method has the benefit of generating unbiased and efficient estimates, and provides better estimates of standard errors than mean substitution does (Allison 2001). Multiple imputation analysis assumes that data are missing at random; five data sets can be sampled from the original data set with randomly imputed values for the missing data. The SAS multiple imputation procedure was used to generate the missing data; these five imputed data sets were then used to conduct the multilevel analysis five times, generating five sets of coefficients and standard errors. These results were merged using the HLM software; Rubin's (1987) algorithms were used to calculate unbiased and efficient estimates of coefficients and standard errors (Allison 2001).

3. The standard deviation of the leadership variable is .85 (see Table 1). To determine how much of a standard deviation change is equal to 1, divide 1 by .85, which is 1.17. Thus, for an increase of 1.17 standard deviations of leadership, there will be an increase of .27 in algorithmic instruction. To translate this into a change in leadership

on the 5-point scale, using the unstandardized means and standards deviations reported in the appendix in Table A2 (mean=3.97, sd=.81), a rise of 1.17 standard deviations changes the value of leadership from 3.97 to (3.97+1.17*.81), or 4.92. Thus, a coefficient of .27 (see Table 4, Model 1) indicates that a change from 3.97 to 4.92 on the leadership scale corresponds to an increase of .25 days more of algorithmic teaching.

4. A coefficient of .98 (see Table 5, Model 2) means that for an increase of 1.4 standard deviations (.71 is the standard deviation of collaboration, and 1/.71=1.4) of collaboration there will be an increase of about a day (.98) per month of conceptual teaching. So a rise of 1.4 standard deviations changes the value of collaboration from 2.99 (unstandardized mean) to 4.19 (i.e., 2.99+1.4*.86, where .86 is the unstandardized standard deviation of collaboration). Thus, a coefficient of .98 indicates that when teachers increase their collaboration from 2.99 days per month to 4.19 days per month, there is a corresponding increase of .98 days of conceptual teaching.

5. A rise in interactive professional development of 1.58 standard deviations (1/.63=1.58, where .63 is the standard deviation of professional development) changes the value of professional development from 1.40 (unstandardized mean) to 1.87 (1.40+1.58*.30, where .30 is the unstandardized standard deviation). Thus the coefficient of .73 means that when teachers increase the number of types of interactive professional development they participate in from 1.4 (between 1 and 2 activities) to 1.87 (about 2 activities), there is an increase of .73 days of basic instruction per month, and an increase of .87 days of conceptual instruction (.73 and

.87 are the coefficients in Model 2 in Table 5). Recall that the professional development scale is comprised of an index of four different types of interactive activities, and response categories are 0=no and 1=yes, so teachers can score a low of 0 (participates in no interactive professional development) and a high of 4 (participates in all 4 types of interactive professional development) on the composite.

6. An increase from 4.14 (unstandardized mean) to 4.92 (4.14+1.28*.61, where 1.28=1/.78, the standardized standard deviation) roughly corresponds to a change from "agree" to "strongly agree," where 4=agree and 5=strongly agree.

7. This is not to say that interactions and social-psychological perceptions are not correlated; supplemental analyses show that teacher-level collaboration and interactive professional development do have a small direct relationship with social-psychological professional community.

8. In fact, supplemental analyses show structural aspects of professional community explain much of the relationship between social-psychological sense of community and instruction.

References

Allison, P.D. (2001). *Missing Data.* Thousand Oaks: Sage.

Aquilino, W.S. (1994). Interview mode effects in drug surveys. *Public Opinion Quarterly*, *58*(2), 210-240.

Anyon, J. (1981). Social class and school knowledge. *Curriculum Inquiry, 11,* 3-45.

Ball, D.L. (1991). Research on teaching mathematics: Making subject matter knowledge part of the equation. In J. Brophy (Ed.), *Advances in research on teaching: Volume 2. Teacher's knowledge of subject matter as it relates to their teaching practices* (pp. 1-48). Greenwich, CT: JAI.

Ball, D.L. (1993). With an eye on the mathematical horizon: Dilemmas of teaching elementary school mathematics. *The Elementary School Journal*, *93*(4), 373-397.

Barr, R., & Dreeben, R. (1983). *How schools work.* Chicago: University of Chicago Press.

Barr, R., & Dreeben, R. (1988). The formation and instruction of ability groups. *American Journal of Education, 97*(1), 34-64.

Bidwell, C.E., & Kasarda, J.D. (1980). Conceptualizing and measuring the effects of school and schooling. *American Journal of Education,* 401-430.

Bird, T., & Little, J.W. (1985). *Instructional leadership in eight secondary schools*. Final report to the National Institute of Education. Boulder, CO: Center for Action Research.

Bridges, E. & Hallinan, M. (1978). Subunit Size, Work System Interdependence, and Employee Absenteeism. *Educational Administration Quarterly*, *14*(2): 24-42.

Brophy, J., & Good, T. (1986). Teacher behavior and student achievement. In M. Wittrock (Ed.), *Handbook of research on teaching* (pp. 340-370). NY: Macmillan.

Brown, A., & Campione, J. (1990). Communities of learning and thinking, or a context by any other name. *Contributions to Human Development, 21,* 108-126.

Brown, J., Collins, A., & Duguid, P. (1989). Situated cognition and the culture of learning. *Educational Researcher, 18*(1), 32-42.

Bryk, A. S., & Driscoll, M. E. (1988). *The high school as community: Contextual influences and consequences for students and teachers.* Madison, Wisconsin: National Center on Effective Secondary Schools, University of Wisconsin.

Bryk, A.S., Lee, V.E., & Holland, P.B. (1993). *Catholic schools and the common good.* Cambridge, MA: Harvard University Press.

Bryk, A.S., Easton, J.Q., Kerbow, D., Rollow, S.G., & Sebring, P.A. (1993). *A view from the elementary schools: The state of reform in Chicago.* Chicago: Consortium on Chicago School Research.

Bryk, A. and Raudenbush, S. (1988). Toward a more appropriate conceptualization of research on school effects: A three-level Hierarchical Linear Model. *American Journal of Education,* 65-107.

Burstein, L., McDonnell, L.M., Van Winkle, J., Ormseth, T., Mirocha, J., & Guitton, G. (1995). *Validating national curriculum indicators*. Santa Monica, CA: RAND.

Carpenter, T. P., Fennema, E., & Franke, M. L. (1996). Cognitively guided instruction: a knowledge base for reform in primary mathematics instruction. *The Elementary School Journal, 97,* 3-20

Carpenter, T.P., Fennema, E., Peterson, P.L., Chiang, C., & Loef, M. (1989). Using knowledge of children's mathematics thinking in classroom teaching: An experimental study. *American Educational Research Journal, 26*(4), 499-531.

Carroll, J. (1963). A model of school learning. *Teachers College Record, 64,* 722-733.

Clements, D.H., & Sarama, J. (Eds.), (2004). *Engaging young children in mathematics: Standards for early childhood mathematics education.* Mahwah, NJ: Lawrence Erlbaum Associates, Inc.

Cobb, P. (1988). The tension between theories of learning and instruction in mathematics education. *Education Psychologist*, *23*(2), 97-103.

Cobb, P., Wood, T., Yackel, E., & McNeal, B. (1992). Characteristics of classroom mathematics traditions: An interactional analysis. *American Educational Research Journa*l, 29(3), 573-604.

Cobb, P., Wood, T., Yackel, E., Nicholls, J., Grayson, W., Trigatti, B., & Perlwitz, M. (1991). Assessment of a problem-centered second-grade mathematics project. *Journal for Research in Mathematics Education*, *22*(1),:3-29.

Cohen, D.K. (1988). Knowledge of teaching: Plus que ca change…In P.W. Jackson (Ed.), *Contributing to educational change* (pp. 27-84). Berkeley, CA: McCutcheon.

Cohen, D. K. (1990). A revolution in one classroom: The case of Mrs. Oublier. *Educational Evaluation and Policy Analysis, 12*(3), 311-329.

Cohen, D., & Ball, D. (1990a). Policy and practice: An overview. *Educational Evaluation and Policy Analysis*, *12*(3), 347-353.

Cohen, D. & Ball (1990b). Relations between policy and practice: A commentary. *Educational Evaluation and Policy Analysis*, *12*(3), 249-56.

Cohen, D. and Ball, D. (1999). *Instruction, capacity, and improvement.* CPRE Research Report Series, RR-43. University of Pennsylvania: Consortium for Policy Research in Education.

Cohen, D., & Hill, H. (2000). *Learning policy: When state education reform works.* New Haven: Yale University Press.

Cohen, D.K., Raudenbush, S.W., & Ball, D.L. (2003). Resources, instruction, and research. *Educational Evaluation and Policy Analysis*, *25*(2), 119-142.

Coleman, J. et al. (1966). *Equality of educational opportunity*. U.S. Office of Education. Washington, DC: USGPO.

Coleman, J.S., Hoffer, T., & Kilgore, S. (1982). *High school achievement: Public Catholic and private schools compared.* New York: Basic Books.

Conley, S. (1991). Review of research on teacher participation in school decision making. In G. Grand (ed.), *Review of Research in Education 17*. Washington, DC: American Educational Research Association.

Cooley, W.W., & Leinhardt, G. (1980). The instructional dimensions study. *Educational Evaluation and Policy Analysis 2*(1), 7-25.

Creemers, B., & Reezigt. G. (1996). School level conditions affecting the effectiveness of instruction. *School Effectiveness and School Improvement, 7*(3), 197-228.

Datnow, A. (2000). Power & politics in the adoption of whole school reform models. *Educational Evaluation and Policy Analysis*, *22*(4), 357-374.

Denton, K., & West, J. (2002). *Children's reading and mathematics achievement in kindergarten and first grade.* Washington, DC: National Center for Education Statistics.

Desimone, L., Garet, M., Birman, B., Porter, A., & Yoon, K. (2002). How do district management and implementation strategies relate to the quality of the professional development that districts provide to teachers? *Teachers College Record, 104*(7), 1265-1312.

Dillman, D.A., & Tarnai, J. (1991). Mode effects of cognitively designed recall questions: A comparison of answers to telephone and mail surveys. In P.N. Beimer, R.M. Groves, L.E., Lyberg, N.A. Mathiowetz, & S. Sudman (Eds.), *Measurement errors in surveys* (pp. 367-393). New York: John Wiley.

Elmore, R. & Associates (1990). *Restructuring schools: The next generation of educational reform*. San Francisco: Jossey-Bass.

Elmore, R., Abelmann, C., & Fuhrman, S. (1996). The new accountability in state education reform: From process to performance. In Helen Ladd (Ed.), *Holding schools accountable: Performance based reform in education* (pp. 65-98). Washington, DC: Brookings.

Firestone, W. and Pennell, J. (1997). Designing state-sponsored teacher networks: A comparison of two cases. *American Educational Research Journal*, *34*(2), 237-266.

Firestone, W.A., & Rosenblum, S. (1988). Building commitment in urban high schools. *Educational Evaluation and Policy Analysis*, *93*, 285-299.

Firestone, W.A., & Wilson, B.L. (1983). *Using bureaucratic and cultural linkages to improve instruction: The high school principal's contributions*. Philadelphia: Research for Better Schools.

Fowler, F.J., Jr. (2002). *Survey research methods*. 3rd Ed. Applied Social Research Methods Series, Vol. 1. Thousand Oaks, CA: Sage.

Gamoran, A., Porter, A. C., Smithson, J., & White, P. A. (1997). Upgrading high school mathematics instruction: Improving learning opportunities for low-achieving, low-income youth. *Educational Evaluation and Policy Analysis*, *19*(4), 325–338.

Gamoran, A., Secada, W.G., & Marrett, C.B. (2000). The organizational context of teaching and learning: Changing theoretical perspectives. In M.T. Hallinan (Ed.), *Handbook of the Sociology of Education* (pp. 37-63). New York: Kluwer Academic.

Garet, M., Birman, B., Porter, Yoon, K., & Desimone, L. (2001). What makes professional development effective? Analysis of a national sample of teachers. *American Education Research Journal*, *38*(3), 915-945.

Geary, D.C. (2001). A Darwinian perspective on mathematics and instruction. In T. Loveless, *The great curriculum debate: How should we teach reading and math?* (pp. 85-107). Washington, DC: Brookings.

Good, T.L. & Brophy, J. (2000). *Looking in classrooms*, 8th Ed. Reading, MA: Longman.

Goodlad, J. I. (1984). *A place called school: Prospects for the future.* New York: McGraw-Hill.

Hanushek, Eric A. (May 1989). The Impact of Differential Expenditures on School Performance. *Educational Researcher, 18*(4), 45-51, 62.

Herman, J., Klein, D., & Abedi, J. (2000). Assessing students' opportunity to learn: Teacher and student perspectives. *Educational Measurement: Issues and Practice*, *19*(4), 16-24.

Hiebert, J. (1999). Relationships between research and the NCTM Standards. *Journal for Research in Mathematics Education, 30,* 3-19.

Hiebert, J., Carpenter, T. P., Fennema, E., Fuson, K., Human, P., Murray, H., Olivier, A., &

Wearne, D. (1996). Problem solving as a basis for reform in curriculum and instruction: The case of mathematics. *Educational Researcher*, *25*(4), 12-21.

Hiebert, J., Carpenter, T.P., Fennema, E., Fuson, K., Wearne, D., Murray, H., Olivier, A., & Human, P. (1997). *Making sense: Teaching and learning mathematics with understanding.* Portsmouth, NH: Heinemann.

Jencks, S. (1972) *Inequality*. London: Penguin

Johnson, S.M. (1990). *Teachers at work: Achieving success in our schools.* Boston: Basic books.

Kilgore, S.B., Pendleton, W.W. (1993). The organizational context of learning: Framework for understanding the acquisition of knowledge. *Sociology of Education*, *66*(1), 63-87.

Knapp, M. (1997). Between systemic reforms and the mathematics and science classroom: The dynamics of innovation, implementation, and professional learning. *Review of Educational Research, 67*(2), 227-266.

Knapp, M.S., & Shields, P.M. (Eds.) (1990). *Better schooling for children of poverty: Alternatives to conventional wisdom (vol. 2).* Washington DC: U.S. Department of Education, Office of Planning, Budget, and Evaluation.

Knapp, M.S., Shields, P.M., & Turnbull, B.J. (1992). *Academic challenge fro the children of poverty. Summary report.* Washington, DC: U.S. Department of Education.

Kozma, R., & Croninger, R. (1992). Technology and the fate of at-risk students. *Education and Urban Society*; *24*(4), 440-53

Kruse, S., Louis, K., & Bryk, A. (1994). Building professional community in schools. In *Issues in Restructuring Schools, no. 6.* Madison: University of Wisconsin, Center on Organization and Restructuring of Schools.

Lampert, M. (1986). Knowing, doing and teaching mathematics. *Cognition and Instruction, 3*(4), 3-5-342.

Lampert, M. (1990). When the problem is not the question and the solution is not the answer: Mathematical knowing and teaching. *American Educational Research Journal*, *27,* 29-63.

Lampert, M. (1992). Practices and problems in teaching authentic mathematics. In F. Oser, A. Dick, & J.L. Patry (Eds.), *Effective and responsible teaching: The new synthesis* (pp. 295-313). San Francisco: Jossey-Bass.

Lee, V. E., & Bryk, A. S., (1989). A multilevel model of the social distribution of high school achievement. *Sociology of Education, 62,* 172-192.

Lee, V., Dedrick, R., & Smith, J. (1991). The effect of the social organization of schools on teachers' self-efficacy and satisfaction. *Sociology of Education, 64,* 190-208.

Lee, V.E., & Smith, J.B. (1995). Effects of high school restructuring and size on gains in achievement and engagement for early secondary school students. *Sociology of Education, 68,* 241-70.

Lee, V.E., & Smith, J.B. (1996). Collective responsibility for learning and its effects on gains in achievement for early secondary school students. *American Journal of Education, 104,* 103-47.

Lee, V.E., Smith, J.B., & Croninger, R.G. (1997). How high school organization influences the equitable distribution of learning in mathematics and science. *Sociology of Education, 70,* 128-50.

Lehrer, R., Lee, M., & Jeong, A. (1999). Reflective teaching of logo. *Journal of the Learning Sciences*, 8(2), 245-89.

Leithwood, K., Leonard, L., & Sharratt, L. (1998). Conditions fostering organizational learning in schools. *Educational Administration Quarterly*, *34*(2), 243-276.

Little, J.W. (1993). Teachers' professional development in a climate of educational reform. *Educational Evaluation and Policy Analysis*, *15*(2), 129-151.

Little, J.W. (1990). The persistence of privacy: Autonomy and initiative in teachers' professional relations. *Teachers College Record, 91*(4), 509-536.

Little, J. W. (1982). Norms of collegiality and experimentation: Workplace conditions of school success. *American Educational Research Journal*, *19*(3), 325-340.

Loucks-Horsley, S., Hewson, P.W., Love, N., & Stiles, K. (1998) *Designing professional development for teachers of science and mathematics.* Thousand Oaks, CA: Corwin.

Louis, K. S., & Marks, H. M. (1998, August). Does professional community affect the classroom? Teachers' work and student experiences in restructuring schools. *American Journal of Education*, *106*(4), 532- 75. (EJ 576 587)

Louis, K., Marks, H., & Kruse, S. (1996). Teachers' professional community in restructuring schools. *American Educational Research Journal*, *33*, 757-798.

Louis, K.S., & Kruse, S. & Associates. (1995). *Professionalism and community: Perspectives on reforming urban schools*. Thousand Oaks, CA: Corwin.

Loveless, T. (Ed.) (2001). *The great curriculum debate: How should we teach reading and math?* Washington, DC: Brookings.

Ma, L. (1999). *Knowing and teaching elementary mathematics: Teachers' understanding of fundamental mathematics in China and the United States.* Mahwah, NJ: Erlbaum.

Malen, B., Ogawa, R., Kranz, J. (1990). What do we know about school-based management? In W.H. Clune & J.F. White (eds.), *Choice and control in American education, Vol. 2*. New York: Falmer.

Mayer, D. P. (1999). Measuring instructional practice: Can policymakers trust survey data? *Educational Evaluation and Policy Analysis*, 21(1), 29-45.

McCaffrey, D., Hamilton, K., Stecher, B., Klein, S., Bugliari, D., & Robyn, A. (2001). Interaction among instructional practices, curriculum, and student achievement: The case of standards-based high school mathematics. *Journal for Research in Mathematics Education*, *22*(5), 493-517.

McLaughlin, M.W. (1994). Somebody knows my name. In *Issues in restructuring schools* (Issue 7, pp. 9-11). Madison, Wisconsin: Center on Organization and Restructuring of Schools, University of Wisconsin.

McLaughlin, M.W., & Marsh, D.D. (1978). Staff development and school change. *Teachers College Record, 80*(1), 69-94.

McLaughlin, M.W., & Talbert, J. (1993). Introduction: New visions of teaching. In D.K. Cohen, M.W. McLaughlin, & J.E. Talbert (Eds.), *Teaching for understanding: Challenges for policy and practice.* San Francisco: Jossey-Bass.

McLaughlin, M. & Talbert, J. (1999). *Professional community and the work of high school teaching.* Chicago, IL: University of Chicago Press.

McNeil, L. (1988). *Contradictions of control: School structure and school knowledge.* New York: Routledge & Kegan Paul.

Meyer, J. & Cohen, E. (1971). *The impact of the open-space school upon teacher influence and autonomy: The effects of an organizational innovation.* Stanford, CA: Stanford University. (ERIC Document Reproduction Service No. ED 062 291).

Mohrman, A.M., Cooke, R.A., & Mohrman, S.A. (1979). Participation in decision making: A multidimensional perspective. *Educational Administration Quarterly*, *15*(3), 97-113.

Mullens, J. (1995). *Classroom instructional processes: A review of existing measurement approaches and their applicability for the teacher follow-up survey* (NCES 95-15). Washington, DC: National Center for Education Statistics.

Mullens, J. E., and Gayler, K. (1999). *Measuring classroom instructional processes: Using survey and case study field test results to improve item construction.* Washington, DC: U.S. Department of Education, Office of Educational Research and Improvement.

Mullens, J., & Kasprzyk, D. (1996). Using qualitative methods to validate quantitative survey instruments. In *1996 Proceedings of the section on survey research methods* (pp. 638-643). Alexandria, VA: American Statistical Association.

Mullens, J., & Kasprzyk, D. (1999). *Validating item responses on self-report teacher surveys.* Washington, DC: U.S. Department of Education.

Mullis, I. V. S. (1997). *Benchmarking to international achievement: TIMSS as a starting point to examine student achievement* (ORAD-97-1025). Washington, DC: Office of Educational Research and Improvement.

Murphy, J., & Beck, L. G. (1995). *School-based management as school reform: Taking stock.* Newbury Park, CA: Corwin Press.

National Center for Educational Statistics (NCES). 2004. *Early Childhood Longitudinal Survey: Frequently asked questions.* http://nces.ed.gov/ecls/KinderFAQ.asp?faq=4. Accessed June 17, 2004.

National Center for Education Statistics (NCES) (2000). *Early Childhood Longitudinal Study—Kindergarten Base Year: Data files and electronic codebook*. Washington DC: Author.

National Council of Teachers of Mathematics (1989). *Curriculum and evaluation standards for school mathematics.* Reston, VA: Author.

National Council of Teachers of Mathematics (1991). *Professional standards for the teaching of school mathematics.* Washington, DC: Author.

Newmann, F., King, M., & Youngs, P. (2000). Professional development that addresses school capacity: Lessons from urban elementary schools. *American Journal of Education*, *108*(4), 259-299.

Newmann, F., Smith, B., Allensworth, E., Bryk, A. (2001). *School instructional program coherence: Benefits and challenges.* Chicago, IL: Consortium on Chicago School Research.

Newmann, F., Rutter, R., and Smith, M. (1989). Organizational factors that affect school sense of efficacy, community, and expectations. *Sociology of Education, 62,* 221-238.

Newmann, F., & Oliver, D. (1967). Education and community. *Harvard Educational Review*, *37*(1), 61-106.

Newmann, F. & Wehlage, G. (1995). *Successful school restructuring: A report to the public and educators by the Center on Organization and Restructuring of Schools.* Madison, WI: Board of Regents of the University of Wisconsin System.

Pellegrino, J.W., Baxter, G.P., & Glaser, R. (1999). Addressing the "two disciplines" problem: Linking theories of cognition and learning with assessment and instructional practice. *Review of Research in Education, 24*(9), 307-353.

Porter, A. C., Kirst, M. W., Osthoff, E. J., Smithson, J. L., & Schneider, S. A. (1993, October). *Reform up close: An analysis of high school mathematics and science classrooms.* Madison, WI: University of Wisconsin-Madison.

Putnam, R., & Borko, H. (1997). Teacher learning: Implications of new views of cognition. In B.J. Biddle, T.L. Good, & I.F. Goodson (Eds.) *The international handbook of teachers and teaching* (pp. 1223-1296). Dordrecht, The Netherlands: Kluwer.

Raudenbush, S., Rowan, B., & Cheong, Y. (1993). The pursuit of high order instructional goals in secondary schools: Class, teacher and school influences. *American Educational Research Journal*, *30*(3), 523-53.

Rogosa, D. R. (1995). Myths and methods: "Myths about longitudinal research," plus supplemental questions. In J.M. Gottman (Ed.), *The analysis of change* (pp. 3-65). Hillsdale, New Jersey: Erlbaum.

Romberg, T. (1983). A common curriculum for mathematics. In G.D. Fenstermacher & J. Goodlad (Eds.) *Individual differences and the common curriculum* (pp. 121-159). Chicago: National Society for the Study of Education.

Rosenholtz, S. (1989). Workplace conditions that affect teacher quality and commitment: implications for teacher induction programs. *Elementary School Journal*; *89*(4), 421-39.

Rosenholtz, S. (1985). Effective schools: Interpreting the evidence. *American Journal of Education,* 352-388.

Rosenthal, R., & Rosnow, R. (1984). *Essential of behavioral research: Methods and data analysis.* New York: McGraw Hill.

Rowan, B. (1990). Commitment and control: Alternative strategies for the organizational design of schools. *Review of Research in Education*, *16*, 353-89.

Rowan, B. (1994). Comparing teachers' work with work in other occupations: Notes on the professional status of teaching. *Educational Researcher*, *23*, 4-17, 21.

Rowan, B., Bossert, S.T., & Dwyer, D.C. (1983). Research on effective schools: A cautionary note. *Educational Researcher, 12*(4), 24-31.

Rowan, B. (1995). Learning, teaching, and educational administration: Toward a research agenda. *Educational Administration Quarterly*, 31(3), 344-54.

Rowan, B., Chiang, F., & Miller, R. (1997). Using research on employees' performance to study the effects of teachers on students' achievement. *Sociology of Education*, *70*, 256-284.

Rowan, B., Correnti, R., & Miller, R. (2002). *What large-scale survey research tells us about teacher effects on student achievement: Insights from the Prospects study of elementary schools.* Philadelphia, PA: Consortium for Policy Research in Education.

Rowan, B., & Miracle, A. (1983). Systems of ability grouping and the stratification of achievement in elementary schools. *Sociology of Education, 56,* 133-44.

Rubin, D. B. (1987). *Multiple imputation for nonresponse in surveys*. New York: Wiley.

Rutter, M., Maughan, B., Mortimore, P., & Ouston, J. with Alan Smith. (1979). *Fifteen thousand hours: Secondary schools and their effects on children*. Cambridge, MA: Harvard University Press.

Schifter, D. & Fosnot, C. (1993). *Reconstructing mathematics education: Stories of teachers meeting the challenge of reform.* New York: Teachers College Press.

Schmidt, W.H., McKnight, C.C., & Raizen, S.A. (1997). *A splintered vision: An investigation of U.S. science and mathematics education.* Boston: Kluwer Academic.

Shavelson, R.J., Webb, N.M., & Burstein, L. (1986). Measurement of teaching. In M. Wittrock (Ed.), *Handbook of research on teaching* (3rd edition). Washington, DC: American Educational Research Association.

Shore, R. (1997). *Rethinking the brain: New insights into early development.* New York: Families and Work Institute.

Shouse, R. (2001). The impact of traditional and reform-style practices on student mathematics achievement. In T. Loveless, *The great curriculum debate: How should we teach reading and math?* (pp. 108-133). Washington, DC: Brookings.

Silver, E., & Lane, S., (1995). Can instructional reform in urban middle schools help students narrow the mathematics performance gap? Some evidence from the QUASAR project. *Research in Middle Level Education Quarterly, 18*(2), 49-70.

Simon, M. (1986). The teachers' role in increasing student understanding of mathematics. *Educational Leadership*, *43*, 40-43.

Slavin, R. et al. (1990). Success for All: First-Year Outcomes of a Comprehensive Plan for Reforming Urban Education. *American Educational Research Journal*; *27*(2), 255-278.

Slavin, R., Karweit, & Madden, N. (Eds.). (1989). *Effective programs for students at risk*. Needham Heights, MA: Allyn & Bacon.

Smith, J., Lee, V., and Newmann, F. (January 2001). *Instruction and achievement in Chicago elementary schools.* Improving Chicago's Schools: Consortium on Chicago School Research.

Smithson, J.L., & Porter, A.C. (1994). *Measuring classroom practice: Lessons learned from efforts to describe the enacted curriculum—the Reform Up Close study.* CPRE Research Report Series #31. Madison, WI: University of Wisconsin, Consortium for Policy Research in Education.

Snow, C., Burns, M., & Griffin, P. (1998). *Preventing reading difficulties in young children.* Washington, DC: National Research Council. National Academy Press.

Sorensen, A.B., & Hallinan, M. (1977). A reconceptualization of school effects. *Sociology of Education, 50,* 272-89.

Spillane, J., and Zeuli, J. (1999). Reform and teaching: Exploring patterns of practice in the context of national and state mathematics reforms. *Educational Evaluation and Policy Analysis, 21*(1), 1-27.

Stake, R., & Easle, J. (1978). *Case studies in science education* (No. 038-000-00377-1). Washington, DC: U.S. Government Printing Office.

Stevenson, H., & Stigler, J. (1992). *The learning gap: Why our schools are failing and what we can learn from Japanese and Chinese education*. New York: Summit Books.

Stigler, J.W., & Hiebert, J. (1999). *The teaching gap: Best Ideas from the World's Teachers for Improving Education in the Classroom.* New York, NY: The Free Press.

Stringfield, S., & Slavin, R. (1992). A hierarchical longitudinal model for elementary school effects. In B.P.M. Creemers & G.J. Reezigt (Eds.), *Evaluation of educational effectiveness* (pp. 35-69). Groningen: ICO.

Stodolsky, S. S., & Grossman, P. (1995). The impact of subject matter on curricular activity: An analysis of five academic subjects. *American Educational Research Journal, 32*, 227-50.

Talbert, J.E., & McLaughlin, M.W. (1993). Understanding teaching in context. In D. Cohen, M. McLaughlin & J. Talbert (Eds.), *Teaching for understanding*: *Challenges for policy and practice* (pp. 167-206). San Francisco: Jossey-Bass.

Taylor, B. M., Pearson, P. D., Clark, K. F., & Walpole, S. (1999). *Beating the odds in teaching all children to read.* (CIERA Report #2-006). Ann Arbor: CIERA/University of Michigan.

Turnbull, B., Welsh, M., Heid, C., Davis, W., & Ratnofsky, A.C. (1999). *The longitudinal evaluation of school change and performance (LESCP) in Title I schools: Interim report to congress.* Washington, D.C.: Policy Studies Associates/Westat.

Table 1
Standardized Descriptive Statistics

	Mean	SD	Minimum	Maximum
Teacher-level variables (n=4742)				
Professional Community				
Structural Aspects				
Leadership				
Supportive, Focused Principal Leadership	0.00	0.85	-3.13	1.09
School Decision-making	-0.01	0.98	-2.01	1.38
Classroom Decision-making	-0.01	0.99	-3.94	0.75
Interactive Activities				
Collaboration	-0.02	0.71	-.169	2.52
Interactive Professional Development	-0.01	0.63	-0.86	1.25
Social-psychological Aspects				
Sense of Community	-0.01	0.78	-4.21	1.09
Teacher Background Characteristics				
Teaching Experience	-0.00	1.00	-1.27	3.89
1st or 2nd Year Teacher	.12	.32	0	1
No BA in mathematics	0.01	0.09	0.00	1.00
BA in Mathematics	0.26	0.44	0.00	1.00
More than a BA in Mathematics (Masters or Additional Mathematics Classes)	0.67	0.47	0.00	1.00
Math Teacher Courses Taken	-0.01	1.00	-1.59	2.02
No Certification	0.02	0.13	0.00	1.00
Emergency Certification	0.09	0.28	0.00	1.00
Alternative Certification	0.02	0.12	0.00	1.00
Regular Certification	0.50	0.50	0.00	1.00
Advanced Certification	0.33	0.47	0.00	1.00
Fall IRT Score	-0.08	1.00	-2.28	1.94
Full Day Kindergarten	.29	.44	0	1
Time Spent on Math	23.09	10.08	0	45
Class < 27	.10	.29	0	1
1-10% LEP	.77	.40	0	1
1-10% Spec. Ed.	.94	.23	0	1
% Minority in Class	.43	.35	0	1
Instruction				
Basic	10.09	4.35	0.00	21.67
Algorithmic	7.04	4.26	0.00	21.67
Relational	8.37	4.63	0.00	21.67
Conceptual	7.53	4.68	0.00	21.67
School Background Variables (n=969)				
Private School	0.24	0.43	0.00	1.00
Percent Free Lunch	0.37	0.48	0.00	1.00
School Size	-0.00	1.00	-1.87	5.70

Note: Dummy variables have a minimum of 0 and maximum of 1; standardized variables have a mean of 0 and standard deviation of 1; each item in a composite was standardized, then used to create the composite.

Figure 1
A Refined Theory of Professional Community

Dotted arrows reflect current theory. Bold arrows reflect refinement of current theory that (1) separates professional community into structural and social-psychological aspects, (2) separates structural aspects into leadership and interactive, collaborative activities, (3) suggests that leadership has its effect on instruction partially through collaborative activities and social-psychological sense of community and (4) suggests that collaborative activities have their effect on instruction partially through sense of community.

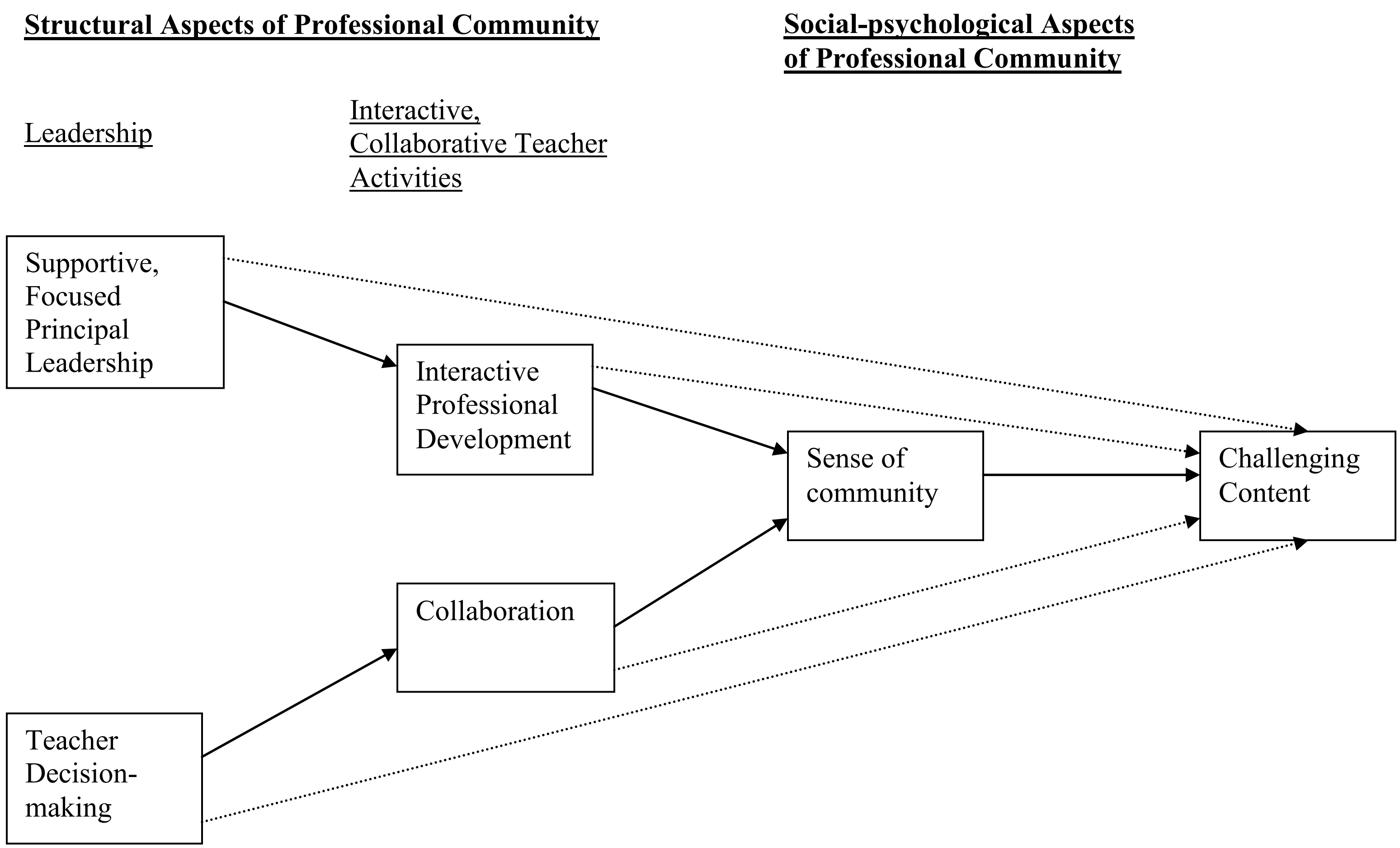

Table 2
Correlation of Main Independent and Dependent Variables

	Leader-ship	School-Level Decision Making	Class-Level Decision Making	Interactive Profes-sional Develop-ment	Collab-oration	Sense of Com-munity	Basic	Algori-thmic	Relational	Con-ceptual
Supportive, Focused Principal Leadership	1.00									
School-Level Decision Making	.37***	1.00								
Class-Level Decision Making	.19***	.30***	1.00							
Interactive Professional Development	.11***	.09***	0.02	1.00						
Collaboration	.07***	.08***	.02**	0.23***	1.00					
Sense of Community	.48***	.31***	.21***	0.06***	0.09***	1.00				
Basic	.07***	-0.03**	.00	0.17***	0.15***	0.03**	1.00			
Algorithmic	.02*	-0.02+	-.00	0.10***	0.14***	0.01	0.56***	1.00		
Relational	.08***	0.00	0.01	0.16***	0.17***	0.06***	0.68***	0.44***	1.00	
Conceptual	.07***	-0.01	0.00	0.18***	0.22***	0.06***	0.50***	0.53***	0.54***	1.00

+ = p <.10, * = p <.05, ** = p <.01, *** = p <.001

Table 3
Model 1, HLM Results Using Leadership and Teacher Decision Making to Predict Instruction

	Basic		Algorithmic		Relational		Conceptual		Relative Amt. of Conceptual	
Variable	Beta	se	Beta	se	beta	se	Beta	se	Beta	se
Intercept	7.73***	0.43	4.26***	0.38	6.56***	0.46	4.59***	0.46	5.43***	0.37
Teacher Level										
Professional Community										
Structural Aspects										
Leadership	0.38***	0.08	0.27***	0.07	0.43***	0.09	0.49***	0.08	0.42***	0.07
School-level decision-making	-0.12+	0.07	-0.02	0.06	-0.05	0.08	-0.09	0.08	-0.06	0.06
Classroom-level decision-making	0.12	0.07	0.07	0.06	0.07	0.08	0.11	0.08	0.09	0.06
Teacher Background Characteristics										
Yrs. of teaching experience	-0.28	0.07	-0.25***	0.06	-0.25**	0.08	-0.01	0.08	-0.16*	0.06
1st or 2nd year teacher	0.16	0.21	-0.16	0.19	0.00	0.23	0.24	0.22	0.08	0.17
No BA in Math[a]	2.46**	0.91	2.97***	0.82	1.4	0.94	0.51	0.73	1.47*	0.71
BA in Math	0.04	0.15	0.16	0.13	-0.28+	0.16	-0.31*	0.16	-0.17	0.12
Math Teacher Courses Taken	-.43***	0.06	0.26***	0.06	0.47***	0.07	0.45***	0.07	0.42***	0.05
No Certification[b]	-0.19	0.61	-0.68	0.45	-0.48	0.63	0.45	0.56	-0.27	0.49
Emergency Certification	0.02	0.25	-0.04	0.22	-0.25	0.27	-0.11	0.26	-0.13	0.21
Alternative Certification	0.77	0.59	-.89	0.55	0.04	0.58	0.31	0.61	-0.13	0.50
Regular Certification	-0.19	0.18	-0.11	0.16	-0.29	0.20	-0.17	-.19	0.40	0.15
Fall IRT Score	-0.21	0.16	-0.55***	0.14	-0.07	0.17	0.74	0.16	0.37**	0.13
Full Day Kindergarten	1.85***	0.24	0.80***	0.20	1.48***	0.24	1.25***	0.23	1.28***	0.18
Time Spent on Math	0.09***	0.01	0.08***	0.01	0.08***	0.01	0.08***	0.01	0.08***	0.01
Class < 27	-0.11	0.32	-0.33	0.27	-0.23	0.31	0.01	0.28	-0.14	0.23
1-10% LEP	-0.20	0.19	-0.24	0.17	0.13	0.19	0.04	0.20	-0.02	0.15
1-10% Spec. Ed.	-0.36	0.25	-0.24	0.24	0.34	0.28	-0.10	0.29	-0.02	0.23
% Minority in Class	0.56*	0.26	-0.42+	0.24	0.07	0.27	0.33	0.27	0.30	0.22
School-Level Demographics										
Private School	0.08	0.25	-0.02	0.23	-0.51*	0.26	-0.63	0.24	-0.40*	0.20
Percent Free Lunch	0.20*	0.09	0.08	0.08	0.05	0.09	0.00	0.09	0.05	0.07
School Size	0.30***	0.08	0.21	0.08	0.25**	0.08	0.38***	0.08	0.30***	0.07
Variance Component										
Level 1 Variance	14.97		11.06		17.92		16.64		10.68	
Level 2 Variance	1.88***		1.97***		1.71***		1.91***		1.26***	
d.f.	963		963		963		963		963	
Chi-Square	1551		1796		1390		1452		1473	
Deviance	26513		25221		27271		26980		24902	
d.f.	2		2		2		2		2	

+ = p <.10, * = p <.05, ** = p <.01, *** = p <.001
[a]Suppressed category=advanced degree in math; [b]Suppressed category is advanced certification.

Table 4
Model 2, HLM Results Using Leadership, Teacher Decision-Making, Interactive Professional Development and Collaboration to Predict Instruction

	Basic		Algorithmic		Relational		Conceptual		Relative Amt. of Conceptual	
Variable	Beta	se	beta	se	beta	se	beta	se	beta	se
Intercept	7.75***	0.42	4.26***	0.38	6.58***	0.45	4.61***	0.44	5.45***	0.35
Teacher Level										
Professional Community										
Structural Aspects										
Leadership										
Supportive, Focused Principal Leadership	0.29***	0.08	0.22**	0.07	0.34***	0.09	0.38***	0.08	0.33***	0.07
School-level Decision-making	-0.20**	0.07	-0.06	0.06	-0.14+	0.07	-0.19*	0.08	-0.15*	0.06
Class-level Decision-making	0.12	0.07	0.07	0.06	0.07	0.07	0.10	0.07	0.09	0.06
Interactive Activities										
Professional Development	0.73***	0.11	0.30**	0.09	0.76***	0.12	0.87***	0.11	0.71***	0.09
Collaboration	0.49***	0.10	0.59***	0.08	0.92***	0.11	0.98***	0.10	0.87***	0.08
Teacher Background Characteristics										
Teaching Experience	-0.24***	0.07	-0.23***	0.06	-0.20**	0.08	0.04	0.08	-0.11+	0.06
1st or 2nd year teacher	0.05	0.21	-0.28	0.19	-0.23	0.22	-0.02	0.22	-0.14	0.17
No BA in Math[a]	2.23	0.84	2.81***	0.8	1.15	0.92	0.20	0.68	1.22+	0.67
BA in Math	0.10	0.14	0.20	0.13	-0.21	0.15	-0.23	0.15	-0.11	0.12
Math Teacher Courses Taken	0.33***	0.06	0.20***	0.06	0.36***	0.07	-0.33***	0.07	0.32***	0.05
No Certification[b]	0.02	0.58	-0.52	0.45	-0.22	0.06	0.34	0.52	-0.03	0.45
Emergency Certification	0.06	0.25	-0.01	0.22	-0.20	0.27	-0.05	0.26	-0.08	0.21
Alternative Certification	0.66	0.56	0.85	0.54	-0.07	0.54	0.19	0.57	0.30	0.46
Regular Certification	-0.18	0.18	-0.01	0.16	-0.27	0.19	-0.14	0.19	-0.17	0.15
Fall IRT Score	-0.23	0.15	-.54***	0.14	-0.09	0.16	0.72***	0.16	0.36***	0.13
Full Day Kindergarten	1.83***	0.23	0.79***	0.20	1.47***	0.24	1.24***	0.22	1.27***	0.18
Time Spent on Math	0.08***	0.01	0.07***	0.01	0.08***	0.01	0.07***	0.01	0.08***	0.01
Class < 27	-0.2	0.31	-0.39	0.27	-0.30	0.31	-0.06	0.29	-0.21	0.23
1-10% LEP	-0.26	0.29	-0.28+	0.17	0.04	0.18	-0.05	0.19	-0.09	0.15
1-10% Spec. Ed.	-0.20	0.24	-0.13	-.24	0.52+	0.27	0.09	0.28	0.14	0.22
% Minority in Class	-.63*	0.26	0.48*	0.24	0.14	0.27	0.41	0.26	0.37+	0.21
School-Level Demographics										
Private School	0.39	0.24	0.21	0.23	-0.16	0.25	-0.25	0.23	-0.07	0.19
Percent Free Lunch	0.20*	0.009	0.09	0.08	0.05	0.09	0.00	0.08	0.05	0.07
School Size	0.27***	0.08	0.19*	0.08	0.23**	0.08	0.35***	0.08	0.27***	0.06
Variance Component										
Level 1 Variance	14.46		10.86		17.3		15.93		10.14	
Level 2 Variance	1.79***		1.95***		1.57***		1.65***		1.11***	
d.f.	963		963		963		963		963	
Chi-Square	1540		1804		1372		1400		1437	
Deviance	26321		25118		27069		26721		24615	
d.f.	2		2		2		2		2	

+ = p <.10, * = p <.05, ** = p <.01, *** = p <.001; [a]Suppressed category=advanced degree in math; [b]Suppressed category is advanced certification.

Table 5
Model 3, HLM Results Using Leadership, Teacher Decision-Making, Interactive Professional Development, Collaboration, and Social-Psychological Sense of Community to Predict Instruction

	Basic		Algorithmic		Relational		Conceptual		Relative Amt. of Conceptual	
Variable	Beta	se	Beta	se	beta	se	beta	se	Beta	se
Intercept	7.77***	0.42	4.29***	0.38	6.6***	0.45	4.63***	0.44	5.47***	0.35
Teacher Level										
Professional Community										
Structural Aspects										
Leadership										
Supportive, Focused Principal Leadership	-0.22*	0.09	0.19*	0.08	0.25**	0.09	0.32***	0.09	0.26***	0.07
School-Level Decision Making	-0.21**	0.07	-0.07	0.00	-0.16*	0.07	-0.21**	0.08	-0.17**	0.06
Class-Level Decision Making	0.11	0.07	0.07	0.06	0.05	0.07	0.09	0.07	0.08	0.06
Interactive Activities										
Professional Development	0.73***	0.11	0.30**	0.09	0.77	0.12	0.87***	0.11	0.71***	0.09
Collaboration	0.78***	0.11	0.58***	0.08	0.90***	0.10	0.97***	0.10	0.85***	0.08
Social-psychological Aspects										
Sense of Community	0.18+	0.09	0.09	0.09	0.24*	0.12	0.16+	0.09	0.17*	0.08
Teacher Background Characteristics										
Teaching Experience	-0.26***	0.07	-0.24***	0.06	-0.22**	0.08	0.03	0.08	-0.13*	0.06
1st or 2nd year teacher	-0.04	0.21	-0.27	0.19	-0.22	0.23	0.00	0.22	-0.13	0.17
No BA in Math[a]	2.28**	0.84	2.87***	0.80	1.20	0.92	0.27	0.68	1.28+	0.67
BA in Math	0.09	0.14	0.19	0.13	-0.22	0.15	-0.25+	0.15	-0.12	0.12
Math Teacher Courses Taken	0.33***	0.06	0.20***	0.06	0.37***	0.07	0.34***	0.07	0.32***	0.05
No Certification[b]	0.02	0.58	-0.52	0.44	-0.22	0.59	0.35	0.52	-0.02	0.45
Emergency Certification	0.08	0.25	0.00	0.22	-0.17	0.27	0.19	0.57	0.31	0.46
Alternative Certification	0.67	0.56	0.85	0.53	-0.06	0.54	0.19	0.57	0.31	0.46
Regular Certification	-0.18	0.18	-0.10	0.16	-0.26	0.19	-0.13	0.19	-0.17	0.15
Fall IRT Score	-0.24	0.15	0.54***	0.14	-0.11	0.16	0.71***	0.16	0.34**	0.13
Full Day Kindergarten	1.82***	0.23	0.79***	0.2	1.45***	0.24	1.23***	0.22	1.26***	0.18
Time Spent on Math	0.08***	0.01	0.07***	0.01	0.08***	0.01	0.07***	0.01	0.08***	0.01
Class < 27	-0.21	0.31	-0.38	0.27	-0.32	0.31	-0.06	0.29	-0.22	0.23
1-10% LEP	-0.26	0.19	-0.29+	0.17	0.30	0.18	-0.06	0.19	-0.10	0.15
1-10% Spec. Ed.	-0.21	0.24	-0.14	0.24	0.51+	0.27	0.08	0.28	0.13	0.22
% Minority in Class	0.63*	0.26	0.48*	0.24	0.15	0.27	0.42	0.26	0.08***	0.01
School-Level										

Demographics										
Private School	0.35	0.24	0.19	0.23	-0.21	0.25	-0.28	0.23	-0.11	0.19
Percent Free Lunch	0.20*	0.09	0.09	0.08	0.05	0.09	0.01	0.08	0.06	0.07
School Size	0.28***	0.08	0.20**	0.08	0.24**	0.08	0.36***	0.08	0.28***	0.06
Variance Component										
Level 1 Variance	14.45		10.84		17.29		15.92		10.13	
Level 2 Variance	1.77***		1.95***		1.56***		1.64***		1.1***	
d.f.	963		963		963		963		963	
Chi-Square	1536		1807		1370		1395		1432	
Deviance	26307		25102		27053		26705		24598	
d.f.	2		2		2		2		2	

+ = p <.10, * = p <.05, ** = p <.01, *** = p <.001
[a]Suppressed category=advanced degree in math; [b]Suppressed category is advanced certification.

Appendix

Figure A1
Scatterplots of Tradeoffs Among Different Types of Instruction

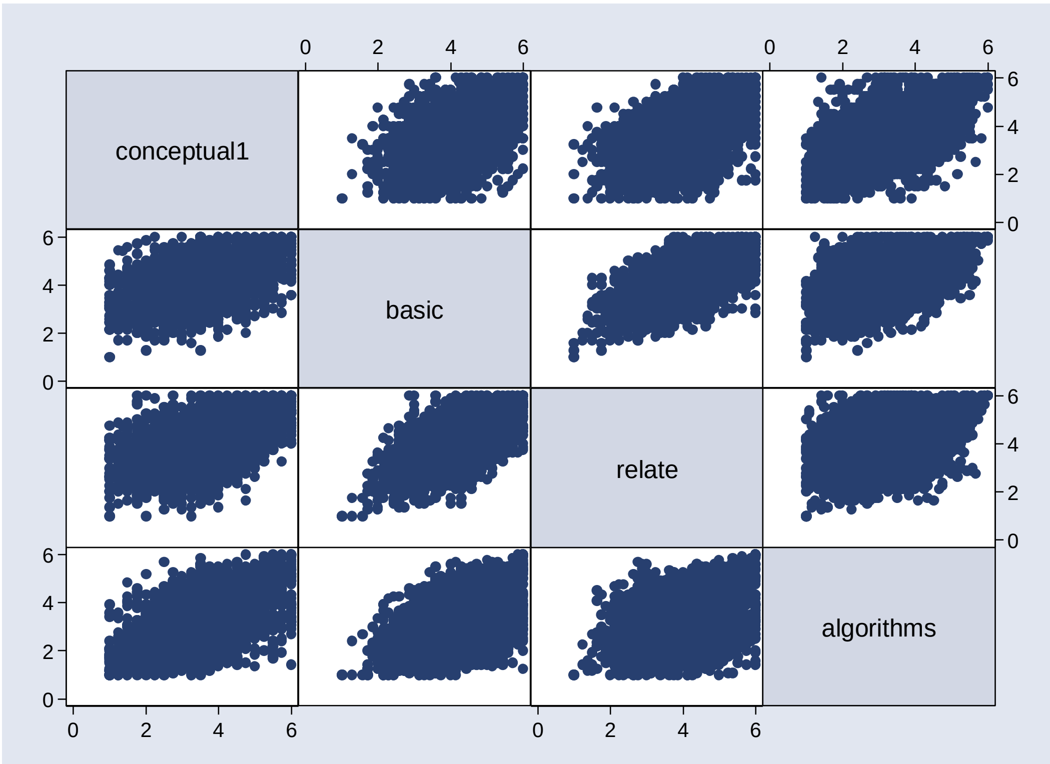

Table A1
Mean Frequency of Instruction Types by Level of Professional Community
B25=Bottom 25%; M50=Middle 50%; T25=Top 25%

	Basic			**Algorithmic**			**Relational**			**Conceptual**		
	B25	*M50*	*T25*	*B25*	*M50*	*T25*	*B25*	*M50*	*T25*	*B25*	*M50*	*T25*
Leadership	3.97	4.0	4.16	3.18	3.12	3.25	3.76	3.83	4.01	3.48	3.49	3.66
School-Level Teacher Decision Making	4.04	4.03	4.3	3.19	3.15	3.13	3.86	3.86	3.85	3.57	3.52	3.50
Class-Level Teacher Decision Making	4.05	4.07	4.06	3.20	3.18	3.17	3.50	3.52	3.52	3.44	3.43	3.47
Collaboration	3.89	4.02	4.20	2.94	3.18	3.35	3.67	3.85	4.06	3.25	3.54	3.80
Interactive Professional Development	3.87	4.05	4.25	2.98	3.20	3.33	3.69	3.87	4.05	3.27	3.57	3.79
Social-Psychological Sense of Community	4.01	4.01	4.15	3.20	3.14	3.21	3.81	3.83	4.03	3.49	3.51	3.67

Table A2
Unstandardized Descriptive Statistics for Professional Community Variables

	Mean	SD	Minimum	Maximum
Teacher-Level Variables				
Supportive, Focused Principal Leadership	3.97	.81	1	5
School-Level Teacher Decision Making	3.36	1.15	1	5
Class-Level Decision Making	4.35	.84	1	5
Interactive Professional Development	1.40	.30	1	2
Collaboration	2.99	.86	1	6
Social-Psychological Sense of Community	4.14	.62	1	5

Bibliography

Allison, P.D. (2001). *Missing Data.* Thousand Oaks: Sage.

Aquilino, W.S. (1994). Interview mode effects in drug surveys. *Public Opinion Quarterly*, *58*(2), 210-240.

Anyon, J. (1981). Social class and school knowledge. *Curriculum Inquiry, 11,* 3-45.

Ball, D.L. (1991). Research on teaching mathematics: Making subject matter knowledge part of the equation. In J. Brophy (Ed.), *Advances in research on teaching: Volume 2. Teacher's knowledge of subject matter as it relates to their teaching practices* (pp. 1-48). Greenwich, CT: JAI Press.

Ball, D.L. (1993). With an eye on the mathematical horizon: Dilemmas of teaching elementary school mathematics. *The Elementary School Journal*, *93*(4), 373-397.

Barr, R., & Dreeben, R. (1983). *How schools work.* Chicago: University of Chicago Press.

Barr, R., & Dreeben, R. (1988). The formation and instruction of ability groups. *American Journal of Education, 97*(1), 34-64.

Bidwell, C.E., & Kasarda, J.D. (1980). Conceptualizing and measuring the effects of school and schooling. *American Journal of Education,* 401-430.

Bird, T., & Little, J.W. (1985). *Instructional leadership in eight secondary schools*. Final report to the National Institute of Education. Boulder, CO: Center for Action Research.

Bridges, E. & Hallinan, M. (1978). Subunit Size, Work System Interdependence, and Employee Absenteeism. *Educational Administration Quarterly*, *14*(2): 24-42.

Brophy, J., & Good, T. (1986). Teacher behavior and student achievement. In M. Wittrock (Ed.), *Handbook of research on teaching* (pp. 340-370). NY: Macmillan.

Brown, A., & Campione, J. (1990). Communities of learning and thinking, or a context by any other name. *Contributions to Human Development, 21,* 108-126.

Brown, J., Collins, A., & Duguid, P. (1989). Situated cognition and the culture of learning. *Educational Researcher, 18*(1), 32-42.

Bryk, A. S., & Driscoll, M. E. (1988). *The high school as community: Contextual influences and consequences for students and teachers.* Madison, Wisconsin: National Center on Effective Secondary Schools, University of Wisconsin.

Bryk, A.S., Lee, V.E., & Holland, P.B. (1993). *Catholic schools and the common good.* Cambridge, MA: Harvard University Press.

Bryk, A.S., Easton, J.Q., Kerbow, D., Rollow, S.G., & Sebring, P.A. (1993). *A view from the elementary schools: The state of reform in Chicago.* Chicago: Consortium on Chicago School Research.

Bryk, A. and Raudenbush, S. (1988). Toward a more appropriate conceptualization of research on school effects: A three-level Hierarchical Linear Model. *American Journal of Education,* 65-107.

Burstein, L., McDonnell, L.M., Van Winkle, J., Ormseth, T., Mirocha, J., & Guitton, G. (1995). *Validating national curriculum indicators*. Santa Monica, CA: RAND.

Carpenter, T. P., Fennema, E., & Franke, M. L. (1996). Cognitively guided instruction: a knowledge base for reform in primary mathematics instruction. *The Elementary School Journal, 97,* 3-20

Carpenter, T.P., Fennema, E., Peterson, P.L., Chiang, C., & Loef, M. (1989). Using knowledge of children's mathematics thinking in classroom teaching: An experimental study. *American Educational Research Journal, 26*(4), 499-531.

Carroll, J. (1963). A model of school learning. *Teachers College Record, 64,* 722-733.

Clements, D.H., & Sarama, J. (Eds.), (2004). *Engaging young children in mathematics: Standards for early childhood mathematics education.* Mahwah, NJ: Lawrence Erlbaum Associates, Inc.

Cobb, P. (1988). The tension between theories of learning and instruction in mathematics education. *Education Psychologist*, *23*(2), 97-103.

Cobb, P., Wood, T., Yackel, E., & McNeal, B. (1992). Characteristics of classroom mathematics traditions: An interactional analysis. *American Educational Research Journa*l, 29(3), 573-604.

Cobb, P., Wood, T., Yackel, E., Nicholls, J., Grayson, W., Trigatti, B., & Perlwitz, M. (1991). Assessment of a problem-centered second-grade mathematics project. *Journal for Research in Mathematics Education*, *22*(1),:3-29.

Cohen, D.K. (1988). Knowledge of teaching: Plus que ca change…In P.W. Jackson (Ed.), *Contributing to educational change* (pp. 27-84). Berkeley, CA: McCutcheon.

Cohen, D. K. (1990). A revolution in one classroom: The case of Mrs. Oublier. *Educational Evaluation and Policy Analysis, 12*(3), 311-329.

Cohen, D., & Ball, D. (1990a). Policy and practice: An overview. *Educational Evaluation and Policy Analysis*, *12*(3), 347-353.

Cohen, D. & Ball (1990b). Relations between policy and practice: A commentary. *Educational Evaluation and Policy Analysis*, *12*(3), 249-56.

Cohen, D. and Ball, D. (1999). *Instruction, capacity, and improvement.* CPRE Research Report Series, RR-43. University of Pennsylvania: Consortium for Policy Research in Education.

Cohen, D., & Hill, H. (2000). *Learning policy: When state education reform works.* New Haven: Yale University Press.

Cohen, D.K., Raudenbush, S.W., & Ball, D.L. (2003). Resources, instruction, and research. *Educational Evaluation and Policy Analysis*, *25*(2), 119-142.

Coleman, J. et al. (1966). *Equality of educational opportunity*. U.S. Office of Education. Washington, DC: USGPO.

Coleman, J.S., Hoffer, T., & Kilgore, S. (1982). *High school achievement: Public Catholic and private schools compared.* New York: Basic Books.

Conley, S. (1991). Review of research on teacher participation in school decision making. In G. Grand (ed.), *Review of Research in Education 17.* Washington, DC: American Educational Research Association.

Cooley, W.W., & Leinhardt, G. (1980). The instructional dimensions study. *Educational Evaluation and Policy Analysis 2*(1), 7-25.

Creemers, B., & Reezigt. G. (1996). School level conditions affecting the effectiveness of instruction. *School Effectiveness and School Improvement, 7*(3), 197-228.

Datnow, A. (2000). Power & politics in the adoption of whole school reform models. *Educational Evaluation and Policy Analysis*, *22*(4), 357-374.

Denton, K., & West, J. (2002). *Children's reading and mathematics achievement in kindergarten and first grade.* Washington, DC: National Center for Education Statistics.

Desimone, L., Garet, M., Birman, B., Porter, A., & Yoon, K. (2002). How do district management and implementation strategies relate to the quality of the professional development that districts provide to teachers? *Teachers College Record, 104*(7), 1265-1312.

Dillman, D.A., & Tarnai, J. (1991). Mode effects of cognitively designed recall questions: A comparison of answers to telephone and mail surveys. In P.N. Beimer, R.M. Groves, L.E., Lyberg, N.A. Mathiowetz, & S. Sudman (Eds.), *Measurement errors in surveys* (pp. 367-393). New York: John Wiley.

Elmore, R. & Associates (1990). *Restructuring schools: The next generation of educational reform*. San Francisco: Jossey-Bass.

Elmore, R., Abelmann, C., & Fuhrman, S. (1996). The new accountability in state education reform: From process to performance. In Helen Ladd (Ed.), *Holding schools accountable: Performance based reform in education* (pp. 65-98). Washington, DC: The Brookings Institution.

Firestone, W. and Pennell, J. (1997). Designing state-sponsored teacher networks: A comparison of two cases. *American Educational Research Journal*, *34*(2), 237-266.

Firestone, W.A., & Rosenblum, S. (1988). Building commitment in urban high schools. *Educational Evaluation and Policy Analysis*, *93*, 285-299.

Firestone, W.A., & Wilson, B.L. (1983). *Using bureaucratic and cultural linkages to improve instruction: The high school principal's contributions*. Philadelphia: Research for Better Schools.

Fowler, F.J., Jr. (2002). *Survey research methods*. 3rd Ed. Applied Social Research Methods Series, Vol. 1. Thousand Oaks, CA: Sage.

Gamoran, A., Porter, A. C., Smithson, J., & White, P. A. (1997). Upgrading high school mathematics instruction: Improving learning opportunities for low-achieving, low-income youth. *Educational Evaluation and Policy Analysis*, *19*(4), 325–338.

Gamoran, A., Secada, W.G., & Marrett, C.B. (2000). The organizational context of teaching and learning: Changing theoretical perspectives. In M.T. Hallinan (Ed.), *Handbook of the Sociology of Education* (pp. 37-63). New York: Kluwer Academic.

Garet, M., Birman, B., Porter, Yoon, K., & Desimone, L. (2001). What makes professional development effective? Analysis of a national sample of teachers. *American Education Research Journal*, *38*(3), 915-945.

Geary, D.C. (2001). A Darwinian perspective on mathematics and instruction. In T. Loveless, *The great curriculum debate: How should we teach reading and math?* (pp. 85-107). Washington, DC: Brookings

Good, T.L. & Brophy, J. (2000). *Looking in classrooms*, 8th Ed. Reading, MA: Longman.

Goodlad, J. I. (1984). *A place called school: Prospects for the future.* New York: McGraw-Hill.

Hanushek, Eric A. (May 1989). The Impact of Differential Expenditures on School Performance. *Educational Researcher, 18*(4), 45-51, 62.

Herman, J., Klein, D., & Abedi, J. (2000). Assessing students' opportunity to learn: Teacher and student perspectives. *Educational Measurement: Issues and Practice*, *19*(4), 16-24.

Hiebert, J. (1999). Relationships between research and the NCTM Standards. *Journal for Research in Mathematics Education, 30,* 3-19.

Hiebert, J., Carpenter, T. P., Fennema, E., Fuson, K., Human, P., Murray, H., Olivier, A., & Wearne, D. (1996). Problem solving as a basis for reform in curriculum and instruction: The case of mathematics. *Educational Researcher*, *25*(4), 12-21.

Hiebert, J., Carpenter, T.P., Fennema, E., Fuson, K., Wearne, D., Murray, H., Olivier, A., & Human, P. (1997). *Making sense: Teaching and learning mathematics with understanding.* Portsmouth, NH: Heinemann.

Jencks, S. (1972) *Inequality*. London: Penguin

Johnson, S.M. (1990). *Teachers at work: Achieving success in our schools.* Boston: Basic books.

Kilgore, S.B., Pendleton, W.W. (1993). The organizational context of learning: Framework for understanding the acquisition of knowledge. *Sociology of Education*, *66*(1), 63-87.

Knapp, M. (1997). Between systemic reforms and the mathematics and science classroom: The dynamics of innovation, implementation, and professional learning. *Review of Educational Research, 67*(2), 227-266.

Knapp, M.S., & Shields, P.M. (Eds.) (1990). *Better schooling for children of poverty: Alternatives to conventional wisdom (vol. 2).* Washington DC: U.S. Department of Education, Office of Planning, Budget, and Evaluation.

Knapp, M.S., Shields, P.M., & Turnbull, B.J. (1992). *Academic challenge fro the children of poverty. Summary report.* Washington, DC: U.S. Department of Education.

Kozma, R., & Croninger, R. (1992). Technology and the fate of at-risk students. *Education and Urban Society*; *24*(4), 440-53

Kruse, S., Louis, K., & Bryk, A. (1994). Building professional community in schools. In *Issues in Restructuring Schools, no. 6.* Madison: University of Wisconsin, Center on Organization and Restructuring of Schools.

Lampert, M. (1986). Knowing, doing and teaching mathematics. *Cognition and Instruction, 3*(4), 3-5-342.

Lampert, M. (1990). When the problem is not the question and the solution is not the answer: Mathematical knowing and teaching. *American Educational Research Journal*, *27,* 29-63.

Lampert, M. (1992). Practices and problems in teaching authentic mathematics. In F. Oser, A. Dick, & J.L. Patry (Eds.), *Effective and responsible teaching: The new synthesis* (pp. 295-313). San Francisco: Jossey-Bass.

Lee, V. E., & Bryk, A. S., (1989). A multilevel model of the social distribution of high school achievement. *Sociology of Education, 62,* 172-192.

Lee, V., Dedrick, R., & Smith, J. (1991). The effect of the social organization of schools on teachers' self-efficacy and satisfaction. *Sociology of Education, 64,* 190-208.

Lee, V.E., & Smith, J.B. (1995). Effects of high school restructuring and size on gains in achievement and engagement for early secondary school students. *Sociology of Education, 68,* 241-70.

Lee, V.E., & Smith, J.B. (1996). Collective responsibility for learning and its effects on gains in achievement for early secondary school students. *American Journal of Education, 104,* 103-47.

Lee, V.E., Smith, J.B., & Croninger, R.G. (1997). How high school organization influences the equitable distribution of learning in mathematics and science. *Sociology of Education, 70,* 128-50.

Lehrer, R., Lee, M., & Jeong, A. (1999). Reflective teaching of logo. *Journal of the Learning Sciences*, 8(2), 245-89.

Leithwood, K., Leonard, L., & Sharratt, L. (1998). Conditions fostering organizational learning in schools. *Educational Administration Quarterly*, *34*(2), 243-276.
Little, J.W. (1993). Teachers' professional development in a climate of educational reform. *Educational Evaluation and Policy Analysis*, *15*(2), 129-151.
Little, J.W. (1990). The persistence of privacy: Autonomy and initiative in teachers' professional relations. *Teachers College Record, 91*(4), 509-536.
Little, J. W. (1982). Norms of collegiality and experimentation: Workplace conditions of school success. *American Educational Research Journal*, *19*(3), 325-340.
Loucks-Horsley, S., Hewson, P.W., Love, N., & Stiles, K. (1998) *Designing professional development for teachers of science and mathematics.* Thousand Oaks, CA: Corwin Press.
Louis, K. S., & Marks, H. M. (1998, August). Does professional community affect the classroom? Teachers' work and student experiences in restructuring schools. *American Journal of Education*, *106*(4), 532- 75. (EJ 576 587)
Louis, K., Marks, H., & Kruse, S. (1996). Teachers' professional community in restructuring schools. *American Educational Research Journal*, *33*, 757-798.
Louis, K.S., & Kruse, S. & Associates. (1995). *Professionalism and community: Perspectives on reforming urban schools*. Thousand Oaks, CA: Corwin Press.
Loveless, T. (Ed.) (2001). *The great curriculum debate: How should we teach reading and math?* Washington, DC: Brookings Institution.
Ma, L. (1999). *Knowing and teaching elementary mathematics: Teachers' understanding of fundamental mathematics in China and the United States.* Mahwah, NJ: Erlbaum.
Malen, B., Ogawa, R., Kranz, J. (1990). What do we know about school-based management? In W.H. Clune & J.F. White (eds.), *Choice and control in American education, Vol. 2.* New York: Falmer.
Mayer, D. P. (1999). Measuring instructional practice: Can policymakers trust survey data? *Educational Evaluation and Policy Analysis*, 21(1), 29-45.
McCaffrey, D., Hamilton, K., Stecher, B., Klein, S., Bugliari, D., & Robyn, A. (2001). Interaction among instructional practices, curriculum, and student achievement: The case of standards-based high school mathematics. *Journal for Research in Mathematics Education*, *22*(5), 493-517.
McLaughlin, M.W. (1994). Somebody knows my name. In *Issues in restructuring schools* (Issue 7, pp. 9-11). Madison, Wisconsin: Center on Organization and Restructuring of Schools, University of Wisconsin.
McLaughlin, M.W., & Marsh, D.D. (1978). Staff development and school change. *Teachers College Record, 80*(1), 69-94.
McLaughlin, M.W., & Talbert, J. (1993). Introduction: New visions of teaching. In D.K. Cohen, M.W. McLaughlin, & J.E. Talbert (Eds.), *Teaching for understanding: Challenges for policy and practice.* San Francisco: Jossey-Bass.
McLaughlin, M. & Talbert, J. (1999). *Professional community and the work of high school teaching.* Chicago, IL: University of Chicago Press.

McNeil, L. (1988). *Contradictions of control: School structure and school knowledge.* New York: Routledge & Kegan Paul.

Meyer, J. & Cohen, E. (1971). *The impact of the open-space school upon teacher influence and autonomy: The effects of an organizational innovation.* Stanford, CA: Stanford University. (ERIC Document Reproduction Service No. ED 062 291).
Mohrman, A.M., Cooke, R.A., & Mohrman, S.A. (1979). Participation in decision making: A multidimensional perspective. *Educational Administration Quarterly*, *15*(3), 97-113.
Mullens, J. (1995). *Classroom instructional processes: A review of existing measurement approaches and their applicability for the teacher follow-up survey* (NCES 95-15). Washington, DC: National Center for Education Statistics.
Mullens, J. E., and Gayler, K. (1999). *Measuring classroom instructional processes: Using survey and case study field test results to improve item construction.* Washington, DC: U.S. Department of Education, Office of Educational Research and Improvement.
Mullens, J., & Kasprzyk, D. (1996). Using qualitative methods to validate quantitative survey instruments. In *1996 Proceedings of the section on survey research methods* (pp. 638-643). Alexandria, VA: American Statistical Association.
Mullens, J., & Kasprzyk, D. (1999). *Validating item responses on self-report teacher surveys.* Washington, DC: U.S. Department of Education.
Mullis, I. V. S. (1997). *Benchmarking to international achievement: TIMSS as a starting point to examine student achievement* (ORAD-97-1025). Washington, DC: Office of Educational Research and Improvement.
Murphy, J., & Beck, L. G. (1995). *School-based management as school reform: Taking stock.* Newbury Park, CA: Corwin Press.
National Center for Educational Statistics (NCES). 2004. *Early Childhood Longitudinal Survey: Frequently asked questions.* http://nces.ed.gov/ecls/KinderFAQ.asp?faq=4. Accessed June 17, 2004.
National Center for Education Statistics (NCES) (2000). *Early Childhood Longitudinal Study—Kindergarten Base Year: Data files and electronic codebook*. Washington DC: Author.
National Council of Teachers of Mathematics (1989). *Curriculum and evaluation standards for school mathematics.* Reston, VA: Author.
National Council of Teachers of Mathematics (1991). *Professional standards for the teaching of school mathematics.* Washington, DC: Author.
Newmann, F., King, M., & Youngs, P. (2000). Professional development that addresses school capacity: Lessons from urban elementary schools. *American Journal of Education*, *108*(4), 259-299.
Newmann, F., Smith, B., Allensworth, E., Bryk, A. (2001). *School instructional program coherence: Benefits and challenges.* Chicago, IL: Consortium on Chicago School Research.
Newmann, F., Rutter, R., and Smith, M. (1989). Organizational factors that affect school sense of efficacy, community, and expectations. *Sociology of Education, 62,* 221-238.
Newmann, F., & Oliver, D. (1967). Education and community. *Harvard Educational Review*, *37*(1), 61-106.
Newmann, F. & Wehlage, G. (1995). *Successful school restructuring: A report to the public and educators by the Center on Organization and Restructuring of Schools.* Madison, WI: Board of Regents of the University of Wisconsin System.
Pellegrino, J.W., Baxter, G.P., & Glaser, R. (1999). Addressing the "two disciplines" problem: Linking theories of cognition and learning with assessment and instructional practice. *Review of Research in Education, 24*(9), 307-353.

Porter, A. C., Kirst, M. W., Osthoff, E. J., Smithson, J. L., & Schneider, S. A. (1993, October). *Reform up close: An analysis of high school mathematics and science classrooms.* Madison, WI: University of Wisconsin-Madison.

Putnam, R., & Borko, H. (1997). Teacher learning: Implications of new views of cognition. In B.J. Biddle, T.L. Good, & I.F. Goodson (Eds.) *The international handbook of teachers and teaching* (pp. 1223-1296). Dordrecht, The Netherlands: Kluwer.

Raudenbush, S., Rowan, B., & Cheong, Y. (1993). The pursuit of high order instructional goals in secondary schools: Class, teacher and school influences. *American Educational Research Journal*, *30*(3), 523-53.

Rogosa, D. R. (1995). Myths and methods: "Myths about longitudinal research," plus supplemental questions. In J.M. Gottman (Ed.), *The analysis of change* (pp. 3-65). Hillsdale, New Jersey: Lawrence Erlbaum Associates.

Romberg, T. (1983). A common curriculum for mathematics. In G.D. Fenstermacher & J. Goodlad (Eds.) *Individual differences and the common curriculum* (pp. 121-159). Chicago: National Society for the Study of Education.

Rosenholtz, S. (1989). Workplace conditions that affect teacher quality and commitment: implications for teacher induction programs. *Elementary School Journal*; *89*(4), 421-39. Rosenholtz, S. (1985). Effective schools: Interpreting the evidence. *American Journal of Education,* 352-388.

Rosenthal, R., & Rosnow, R. (1984). *Essential of behavioral research: Methods and data analysis.* New York: McGraw Hill.

Rowan, B. (1990). Commitment and control: Alternative strategies for the organizational design of schools. *Review of Research in Education*, *16*, 353-89.

Rowan, B. (1994). Comparing teachers' work with work in other occupations: Notes on the professional status of teaching. *Educational Researcher*, *23*, 4-17, 21.

Rowan, B., Bossert, S.T., & Dwyer, D.C. (1983). Research on effective schools: A cautionary note. *Educational Researcher, 12*(4), 24-31.

Rowan, B. (1995). Learning, teaching, and educational administration: Toward a research agenda. *Educational Administration Quarterly*, 31(3), 344-54.

Rowan, B., Chiang, F., & Miller, R. (1997). Using research on employees' performance to study the effects of teachers on students' achievement. *Sociology of Education*, *70*, 256-284.

Rowan, B., Correnti, R., & Miller, R. (2002). *What large-scale survey research tells us about teacher effects on student achievement: Insights from the Prospects study of elementary schools.* Philadelphia, PA: Consortium for Policy Research in Education.

Rowan, B., & Miracle, A. (1983). Systems of ability grouping and the stratification of achievement in elementary schools. *Sociology of Education, 56,* 133-44.

Rubin, D. B. (1987). *Multiple imputation for nonresponse in surveys*. New York: John Wiley & Sons.

Rutter, M., Maughan, B., Mortimore, P., & Ouston, J. with Alan Smith. (1979). *Fifteen thousand hours: Secondary schools and their effects on children*. Cambridge, MA: Harvard University Press.

Schifter, D. & Fosnot, C. (1993). *Reconstructing mathematics education: Stories of teachers meeting the challenge of reform.* New York: Teachers College Press.

Schmidt, W.H., McKnight, C.C., & Raizen, S.A. (1997). *A splintered vision: An investigation of U.S. science and mathematics education.* Boston: Kluwer Academic.

Shavelson, R.J., Webb, N.M., & Burstein, L. (1986). Measurement of teaching. In M. Wittrock (Ed.), *Handbook of research on teaching* (3rd edition). Washington, DC: American Educational Research Association.

Shore, R. (1997). *Rethinking the brain: New insights into early development.* New York: Families and Work Institute.

Shouse, R. (2001). The impact of traditional and reform-style practices on student mathematics achievement. In T. Loveless, *The great curriculum debate: How should we teach reading and math?* (pp. 108-133). Washington, DC: Brookings.

Silver, E., & Lane, S., (1995). Can instructional reform in urban middle schools help students narrow the mathematics performance gap? Some evidence from the QUASAR project. *Research in Middle Level Education Quarterly, 18*(2), 49-70.

Simon, M. (1986). The teachers' role in increasing student understanding of mathematics. *Educational Leadership*, *43*, 40-43.

Slavin, R. et al. (1990). Success for All: First-Year Outcomes of a Comprehensive Plan for Reforming Urban Education. *American Educational Research Journal*; *27*(2), 255-278.

Slavin, R., Karweit, & Madden, N. (Eds.), *Effective programs for students at risk*. Needham Heights, MA: Allyn and Bacon.

Smith, J., Lee, V., and Newmann, F. (January 2001). *Instruction and achievement in Chicago elementary schools.* Improving Chicago's Schools: Consortium on Chicago School Research.

Smithson, J.L., & Porter, A.C. (1994). *Measuring classroom practice: Lessons learned from efforts to describe the enacted curriculum—the Reform Up Close study.* CPRE Research Report Series #31. Madison, WI: University of Wisconsin, Consortium for Policy Research in Education.

Snow, C., Burns, M., & Griffin, P. (1998). *Preventing reading difficulties in young children.* Washington, DC: National Research Council. National Academy Press.

Sorensen, A.B., & Hallinan, M. (1977). A reconceptualization of school effects. *Sociology of Education, 50,* 272-89.

Spillane, J. and Zeuli, J. (Spring 1999). Reform and teaching: Exploring patterns of practice in the context of national and state mathematics reforms. *Educational Evaluation and Policy Analysis, 21*(1), 1-27.

Stake, R., & Easle, J. (1978). *Case studies in science education* (No. 038-000-00377-1). Washington, DC: U.S. Government Printing Office.

Stevenson, H., & Stigler, J. (1992). *The learning gap: Why our schools are failing and what we can learn from Japanese and Chinese education*. New York: Summit Books.

Stigler, J.W., & Hiebert, J. (1999). *The teaching gap: Best Ideas from the World's Teachers for Improving Education in the Classroom.* New York, NY: The Free Press.

Stringfield, S., & Slavin, R. (1992). A hierarchical longitudinal model for elementary school effects. In B.P.M. Creemers & G.J. Reezigt (Eds.), *Evaluation of educational effectiveness* (pp. 35-69). Groningen: ICO.

Stodolsky, S. S & Grossman, P. (1995). The impact of subject matter on curricular activity: An analysis of five academic subjects. *American Educational Research Journal, 32*, 227-50.

Talbert, J.E., & McLaughlin, M.W. (1993). Understanding teaching in context. In D. Cohen, M. McLaughlin & J. Talbert (Eds.), *Teaching for understanding*: *Challenges for policy and practice* (pp. 167-206). San Francisco: Jossey-Bass.

Taylor, B. M., Pearson, P. D., Clark, K. F., & Walpole, S. (1999). *Beating the odds in teaching all children to read.* (CIERA Report #2-006). Ann Arbor: CIERA/University of Michigan.

Turnbull, B., Welsh, M., Heid, C., Davis, W., Ratnofsky, A.C. (1999). *The longitudinal evaluation of school change and performance (LESCP) in Title I schools: Interim report to congress.* Washington, D.C.: Policy Studies Associates/Westat.

.