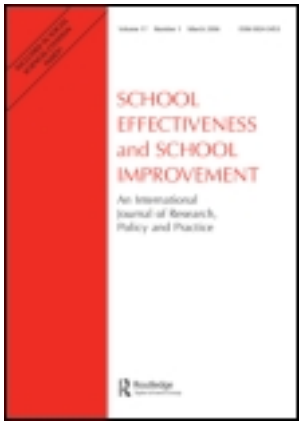

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Local education authorities and student learning: the effects of policies and practices

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Local education authorities and student learning: the effects of policies and practices

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This article addresses an issue that has not been well explored in empirical research, namely whether local education agencies (districts) have an impact on student learning. We assumed that local district effects on learning would be largely indirect, mediated by how teachers work together in schools (in professional communities) and the quality of instruction that is provided. Based on the literature, we also assumed that promoting data-driven decision making was an insufficient stimulus for student learning, and we therefore chose to examine another current policy strategy that is being widely adopted by local authorities: the development of networks for learning among schools. Using survey data and structural equation modeling, our results suggest that the development of networks has a positive relationship with instruction and subsequent learning, while district emphasis on learning targets and data use has a negative relationship. The discussion offers a number of interpretations of the findings, and suggests further arenas for inquiry.

Keywords: data-driven decision making; leadership; districts; professional community; networks

Introduction

In 2004, we set out on a 5-year research project to find out how school leaders affect student learning.[1] Our investigations are on-going, but we are at a point where we are able to integrate what we already knew when we began our quest with what we have learned from talking to hundreds of district office staff, school administrators, teachers, parents, and other stakeholders across the country, as well as surveys of principals and teachers in nearly 150 schools in a random sample of nine states and many different kinds of districts. We come away firmly convinced that the most difficult but most important job of leaders who are based in a local education agency (known as districts in many countries) is to shape the school's culture to focus attention unremittingly on student learning. This represents, according to Firestone (2009), a major shift for many local education agencies.[2]

Until recently, the role of the district office and its chief executive in the United States was to sustain public support for education, to negotiate with teacher unions,

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to carry our priorities and mandates from the government, and to deal with other financial and legal issues (Louis, 1989). Beginning in the 1990s, many states began to require districts to become auditors of school performance – in essence to impose accountability measures that would address the quality of student learning. More recently, there has been a new press toward expanding the role of districts in developing policies and practices that will support achievement, which requires changing the culture of district work from monitoring and allocating resources to developing policies and practices to create more uniform and high functioning schools. Districts have been asked to become shapers of school culture and performance.

The role of most local education agencies is, however, limited by the fact that staff members do not teach and spend a relatively limited amount of time directly working with teachers in classrooms. Instead, their potential for affecting student learning must largely be felt through leadership in developing and communicating priorities, engendering enthusiasm for a vision for student success, providing resources to school-based professionals, and developing some means of focusing effort on a limited number of priorities and targets. This article will address the general question: To what degree do district policies and practices that are intended to focus the attention of teachers and administrators on the need for improvement in instruction and student learning have that effect?

Review of relevant literature

Research on the influence of school district-level policies and actions on the school improvement-related actions of principals and teachers, and on student learning outcomes, presents a mixed picture of seemingly contradictory findings. In one of the few large-scale investigations of district effects, for example, Tymms et al. (2008) analyzed English databases that included pupil performance, applying a complex array of controls for pupil characteristics (e.g., age, gender, poverty, ethnicity) as well as school and local education authority (LEA) characteristics (e.g., indices of poverty, percentage of English as a second language learners). After controlling for all of these variables, the LEAs accounted for 1% or less of the variance in learning outcomes. The authors offer two possible explanations: first, that the policies and actions of local authorities may be quite similar due to the homogenizing influence of government policies and financing and, second, that actions of district education authorities are simply too far removed from the classroom to make much difference.

Whether we should be surprised at the finding that local education agencies have limited impact on the quality of teaching and learning depends in part on what we expect of them. If their role is primarily to act as intermediary administrative units between national/state governments and schools, then the absence of district effects on teaching and learning is not surprising. On the other hand, where the role of LEAs includes significant responsibility for providing direction and support for improvement in teaching and learning, as is the case in many countries, there is greater cause for concern.

A second consideration pertains to size and capacity (human, financial, materials) that allow personnel to act in ways that might make a genuine measurable difference in school quality. When we began our study, for example, data from the U.S. National Center for Educational Statistics indicated that 73% of the nation's 14,859 school districts served less than 2,500 students (18% of the entire public

school student population). Large districts serving more than 25,000 students (obviously located in more urban settings) accounted for only 1.6% of the U.S. school districts but served 32% of the total student population. Variability in size and capacity is a characteristic of LEAs in many countries. In the USA, small districts often consist of four to six schools, and the district office often employs no more than a handful of professional staff. By contrast, large districts employ multiple layers of administrators with narrow responsibilities, as well as cadres of professional and support staff. Not surprisingly, districts of different sizes approach the problem of developing improved instruction and achievement differently (Louis, Thomas, & Anderson, 2010).

In contrast to the English study cited above, recent investigations of LEA effectiveness in the United States have favored case studies which have been identified unusually effective and/or improving districts (Cawelti & Protheroe, 2001; Snipes, Doolittle, & Herlihy, 2002; Togneri & Anderson, 2003; Zavadsky, 2009). Much of this research converges on a common set of policies, actions, and conditions associated with district-wide improvement and effectiveness (Anderson, 2006; Leithwood, 2010), most of which are consistent with investigations that have focused more specifically on the actions of senior administrators (Murphy & Hallinger, 1986; Waters & Marzano, 2006).

While findings and claims about district-level policies and actions in such settings cannot be generalized to all districts, even within the United States, it is hard to dismiss the implication that if some can make a profound difference, then all should be held to that standard. However, while the findings from these studies often provide practical suggestions about how to achieve quality student learning, uncertainty remains as to which policies and practices are most likely to affect teaching and learning.

In this article, we focus on two arenas of LEA initiatives that have come under increasing scrutiny in a number of countries over the past decade: policies that support the use of data and accountability targets directed at improving student achievement and practices that support the development of more cohesive or stronger leadership cultures that focus on improvements in curriculum and instruction, often called networked learning communities.

Local education agencies and data use

It is not news that central office personnel in academically high-performing local agencies work to establish clear targets for improvement, and that they actively collect and use data on student achievement, program implementation, and personnel evaluation to set goals, plan for improvement, and monitor progress (Murphy & Hallinger, 1986). The expectation that all local educators engage in data-informed decision making as a key strategy for continuous improvement at both the school district and school levels has, however, been heightened under the testing and accountability systems that have been instituted in many countries over the last few decades. This has led to widespread and increasing emphasis, support, and research on uses of data (test data and other information) by school personnel to inform decisions about improvement in student learning.

Research on data use for improvement-related decision making often starts from the premise that increased use of systematically collected data on student performance and conditions affecting student performance contributes to the quality

of teaching and learning. As others have noted (Honig & Coburn, 2008; Wohlstetter, Datnow, & Park, 2008), much of this research focuses on the uses of data by school district and/or school personnel and on conditions affecting data use. Measuring the impact of data use for teaching and for student outcomes is relatively rare, although Chrispeels, Castillo, and Brown (2000) found that data use by school-based leadership teams was predictive of a focus on teaching and learning.

Another limitation in our understanding of current expectations for data-informed decision making arises from research that focuses primarily on small samples of LEAs and/or schools that have reputations as active data users (Wolhstetter et al., 2008) or on the implementation of particular data-use systems developed and supported by external organizations (Boudette & Steele, 2007; Copland, 2003). While providing insights into what effective data use looks like, this line of research does not represent what is happening in the majority of schools and agencies. Research on data use in ''typical'' schools and districts presents a far more sobering picture of the challenges of incorporating data use into the ongoing work of school system and school administrators and teachers (Anderson, Leithwood, & Strauss, 2010; Ikemoto & Marsh, 2007; Massell & Goertz, 2002; Wayman, Cho, Jimerson, & Snodgrass Rangel, 2010).

Research on data use practices in LEAs, and the difference they make for instruction and outcomes at the school level, varies greatly in scope and depth. One strand focuses on the use of evidence in decision making related to student learning at the board and central office level. Coburn, Touré, and Yamashita (2009) dispel idealized visions of district decision making as a rational process ''driven'' by hard data and point to micropolitical efforts to use evidence to support prior beliefs and commitments. Less attention, however, is paid to how district data use might influence school leadership, instructional practices, and the nature and outcomes of student learning. In general, this line of research stops short of systematically analyzing the interaction of district data use with other strands of district improvement activity.

Much of the research on data use and decision making centers on data use by teachers, and principals at the school level treat district data use activities and support as an external support or hindrance (Ingram, Louis, & Schroeder, 2004). Anderson et al. (2010), for example, cite four key ways that district leaders influence principal and teacher data use for school improvement, including (1) monitoring data use, (2) modeling data use in district decision making, (3) providing tools and resources to facilitate data, and (4) developing internal expertise to support data use (see also Wohlstetter et al., 2008). While such analyses increase understanding about how district policies and actions affect school data-use activities, they skirt the question of whether that matters for teaching and learning.

Districts and developing cohesive cultures of improvement

In order to have an impact on student learning, districts may need to do more than emphasize the use of data to drive decisions. We know from recent research that principals' leadership is associated, albeit indirectly, with improved classroom instruction and student learning (Louis, Dretzke, & Wahlstrom, 2010) and that teacher leadership also has a significant and more direct impact (Marks & Louis, 1997). However, what we know about how districts fit into this change dynamic is less clear.

In the 1970s and 1980s, studies began to document differences in district-level orientations and approaches to educational change. Berman and McLaughlin (1978) found that teachers and principals implemented new programs and developed new practices more effectively in districts that approached change with a problem-solving orientation. Rosenholtz (1991) showed that effective schools were likely to be located in districts that give a higher priority to improving teaching and learning. In a study of urban school improvement, districts that emphasized professional investment (providing support for principals and teachers to develop) were quite distinct from those that emphasized generic innovation or accountability (Louis, 1989). Like Berman and McLaughlin, Louis emphasized the importance of relationships between schools and districts, as evident in levels of bureaucratic control (rules and regulations) and organizational coupling (e.g., shared goals, community, joint planning and coordination).

Although the school leader's contribution to student achievement was also firmly established in the mid 1980s, the capacity of districts to support the development of relevant leadership capacities in principals has been very limited until quite recently (Resnick & Glennen, 2002). There is, however, accumulating evidence that district practices can lead to more consistent instructional and shared leadership (Louis, Leithwood, et al., 2010; Mangin, 2007; Stein, Hubbard, & Touré, 2009). The emphasis has moved toward examining local education agencies as complex systems in which moving parts (accountability, instructional focus, data-driven decision making, etc.) need to be integrated into a consistent message (Knapp, Copland, Honig, Plecki, & Portin, 2010). In particular, consistent district professional development has been shown in one large-scale study to be associated with increased principal leadership skills (Barnes, Camburn, Sanders, & Sebastian, 2010).

As noted above, there is an emerging consensus that accountability needs to be tempered with a culture change that focuses on creating a collaborative district-wide flow of ideas (Leithwood & Jantzi, 2008). Early research indicates that these "weak ties" among individuals and organizations create more powerful settings for learning new ideas than the strong connections that occur within more tightly knit groups (Granovetter, 1973). More recently, Edge and Mylopoulos (2008) argue that it is important to provide professional development for leaders that creates networks of collaboration across schools. Other authors argue that the development of "networked learning communities" that link schools with common innovation agendas is a new paradigm that expands the more traditional job-embedded adult learning models to include school-to-school connections around joint tasks (Earl & Katz, 2007; Jackson & Temperley, 2007).

Despite this positive feature of district-level networked learning communities, Daly and Finnigan's (2010) analysis of district leaders' networks in a mid-size US school district indicates that there are still sparse communication and knowledge ties among and between principals and central office administrators. In a similar vein, Earl and Katz (2007), who have conducted the largest examination of school networks, point out that school leaders still spend most of their time working on innovation within their local settings, and suggest that the positive effects of networked schools would increase if leaders spent more time on networks. In addition, at least one study indicates that there are tensions both in the definition of what a networked community means in practice and governance issues related to the role of local authorities (Trotman, 2009). In settings where there is a local education agency, schools belonging to that administrative area make an obvious target for

creating a cross-school community of learners. While the studies cited above provide rich descriptions of what these more cohesive cultures of learning might look like, they do not examine their impacts on classrooms and students.

Teachers' professional community as the locus for school improvement

In spite of the increasing enthusiasm for developing district-level collaborative cultures, adult relationships within schools are even more important as a foundation for the way in which teachers work to improve instruction (Louis & Freeman, 2006; Stoll, Bolam, McMahon, Wallace, & Thomas, 2006). In this article, we emphasize the importance of professional community, largely because of the accumulating evidence that it is related both to improved instruction and to student achievement (King & Newmann, 2001; Louis, Dretzke, & Wahlstrom, 2010; Louis & Marks, 1998; Smylie & Wenzel, 2003). Professional community may be viewed as a vehicle for the exercise of teacher leadership (York-Barr & Duke, 2004) because the support that they receive from peers enables them to assume various roles with one another as mentor, mentee, coach, specialist, advisor, facilitator, and so forth. However, professional community is more than just support, but includes shared values, a common focus on student learning, collaboration in the development of curriculum and instruction, and the purposeful sharing of practices – all of which may be thought of as leadership (Hord & Sommers, 2008).

The findings of these studies suggest that when professional communities focus on the quality of learning, teachers adopt more effective instructional practices. The presence of professional community appears to foster collective learning of new practices (Marks, Louis, & Printy, 2002).[3] Many factors affect whether or not professional community exists in a school, but one of the most significant is principal leadership (Bryk, Camburn, & Louis, 1999; Louis, Dretzke, & Wahlstrom, 2010; Wiley, 2001; Youngs & King, 2002). Local authorities should also have considerable influence over whether teachers are able to develop close working ties. In many countries, they control most of the resources that teachers need for their professional development and therefore determine whether teachers have the opportunity to work together in meaningful learning settings (Little, 1989).

The evidence suggesting that control over resources contributes to a ''district effect'' is contested, however. Some, like Stein and Coburn (2008) and D'Amico and Stein (2002), use detailed case studies to show how district policies and practices can result in new forms of teacher collaboration and learning. Others argue, however, that many local authorities are weak in their organizational coherence and capacity and therefore may have limited impact on schools (Spillane, 1998). In a more recent article, Stein and her colleagues find that the frequent cycling of reforms at the district levels disrupts teacher opportunities to form solid learning relationships with one another (Heath Kaufman & Stein, 2010).

In England, where controversies over the role of local education authorities have been a significant element of educational policy over several decades, the results are also ambiguous. Local authorities have, under both Conservative and Labor governments, been reduced in both authority and size (Day, Sammons, Hopkins, Leithwood, & Kington, 2008). However, there is still some evidence of variability in the degree to which they promoted networks and learning among teachers, and more effective authorities were perceived as providing services that were focused on building networks (Riley, Docking, & Rowles, 1999).

Overall, however, there is not a great deal of research that connects local authority policies and practices with how teachers learn and work together in groups. Leithwood (2008), for example, recently found only 21 methodologically sound studies that examined LEA effectiveness around teacher development, and 9 of these were conducted in two districts. In particular, although Stein and her colleagues (D'Amico & Stein, 2002; Stein & Coburn, 2008) include observations of the way in which principals are included or excluded in the process of district-wide reform, there have been no serious investigations of the layered effect of district policies and practices on the development of teachers' collective efficacy around instructional practices and achievement.

Focused instruction

Districts can influence student learning only through changes in classroom practice. However, there are still some tensions over what kind of practice they should be fostering. Models of good instruction have evolved over the last several decades, but differences among them remain only partially resolved. Fortunately, an emerging body of empirical research points to a dynamic model of instruction that is associated with student achievement and that may serve to bridge the gap between "constructivists" and "direct instruction" proponents. An early review (Brophy, 1986) found clear learning expectations, effective classroom management strategies, and differentiated pacing of instruction based on both the content and the characteristics of the learners were consistently associated with student achievement. Beginning in the late 1980s, the emphasis shifted toward inquiry-based models, in which the teacher's focus was on guiding students toward new understanding through exploration and induction (Fenstermacher & Richardson, 2005; Wiske, 1998). More recently, there is accumulating evidence that teacher's efforts to control the timing and pacing of work in classrooms is important for student learning (Kirschner, Sweller, & Clark, 2006; Kyriakides, 2008; Taylor, Pearson, Clark, & Walpole, 2000).[4] Louis, Dretzke, and Wahlstrom (2010) showed that a model of teaching that combined constructivist and teacher-directed elements was associated with student learning. Added to this incomplete picture are a small number of case studies that link district coaches and district practices that focus on discussion of good practices with improved classroom practice (Coburn, 2006; Stein & Coburn, 2008; Togneri & Anderson, 2003).

Building level and school poverty

Most school effectiveness research assumes that student achievement will vary by the characteristics of their families of origin and that schools with high concentrations of students from less wealthy families typically perform less well on tests. In addition, there is reason to think that district effects on schools might vary depending on school type. We know, for example, that in the United States, districts have typically approached comprehensive curriculum reform more vigorously at the elementary level, and with an emphasis on the core subjects of reading and mathematics. Research-based curriculum materials are more available for the earlier grades. Because most studies are carried out either on small samples or only schools at one level, we know very little about the effects of these variables.[5]

Summary

Our investigation is premised on the assumption that the district's effects on students are almost entirely indirect (Day et al., 2009; Witziers, Bosker, & Kruger, 2003). Insofar as they are associated with student learning, it is likely to be because they affect teachers' instructional practices by

- creating standards and targets that are reinforced through an emphasis on data-driven decision making; or
- by creating more opportunities for shared expectations and norms through the development of district-wide understanding and learning.

In both cases, we would expect local agency policies and practices to work both directly (changing individual teachers' motivation to engage in improved instruction) and indirectly (by creating strong professional communities within the school that reinforce district policies and practices and that lead to stronger instruction). A summary of our general understanding of how districts might influence teacher practice is presented in Figure 1. In this figure, the solid lines represent our main assumptions, while the dotted lines represent the effects of selected school characteristics.

Methodology

Data sources

This article is a secondary analysis of data collected during a 5-year study of the effects of leadership on student learning. The larger study design involved a random sample of nine states and a subsequent stratified random sample of four districts within those states. The variables used for stratification were district size, poverty levels, and study body racial diversity. Within each of the sampled districts, a secondary school and an elementary school were selected to receive principal and teacher surveys. In the end, our achieved sample was 182 buildings. Within the sampled buildings, principals and teachers were asked to fill out a survey at two points in time (2005 and 2008). Teacher surveys were administered during a faculty meeting, while principals and assistant principals filled theirs out individually. More

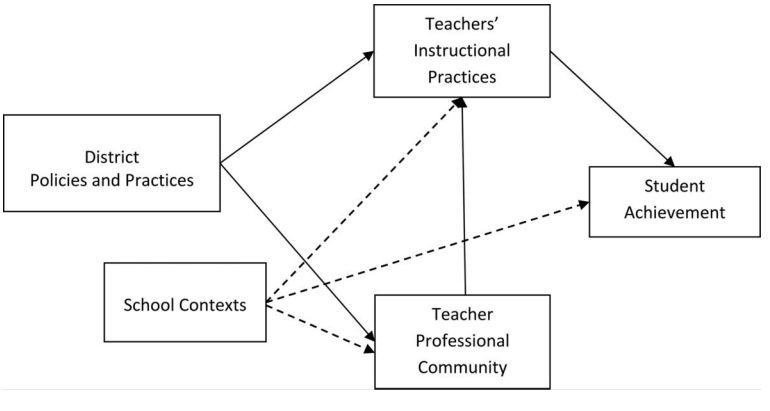

Figure 1. Conceptual framework.

details about the sampling and data collection procedures may be found elsewhere (Louis, Leithwood, et al., 2010, pp. 301–318). Data about the school's achievement levels and demographic characteristics were obtained from public data sources.

The final analysis for this article included 122 schools in which both the teachers and principals responded to both the first and second surveys. Like the larger sample, there were a similar number of elementary (59) and secondary (63) schools.[6]

Measures

Two exogenous latent variables were constructed using items on principals' perceptions of district policies and practices (i.e., district networked community and district use of targets and data). As mediating variables, items measuring teachers' perceptions of teacher professional community and focused learning were employed (see Appendix 1).

While all of the constructs showed one factor structure, "teacher professional community" had three factor structures. Consequently, its 13 items were parceled into three indicators, corresponding to the three substructures (Little, Cunningham, Shahar, & Widaman, 2002). Item parceling was also employed for two other constructs (i.e., district networked community and focused instruction) for (1) the parsimony of the final model, (2) the balance between measurement models and structural models, (3) the reduction of estimation errors (less unique variance), (4) the enhancement of normality of data, and (5) applicability to relatively small sample sizes (Little et al., 2002; Russell et al., 1998). For the two constructs, we parceled five items into three indicators through random parceling (see Appendix 3 for item parceling employed in this study).[7]

Alongside the latent variables, building levels and school poverty were used as exogenous observed variables. As a dependent variable, academic achievement drawn from average school performance of language arts proficiency was employed in the analysis. We further define these below.

- District networked community: This latent construct was based on five items measuring principals' perceptions of district efforts' to foster professional community throughout the district in order to improve student learning. Sample items included: "Our district fosters the flow of ideas throughout the district" and "Our district supports the conditions in schools for teacher collaboration" (Cronbach's alpha = .892).
- District use of targets and data: This construct included three items on principals' perceptions of district support and expectations for data use in order to improve student learning: "Our district incorporates student and school performance data in district-level decision making" and "Our district assists schools with the use of student and school performance data for school improvement planning" (Cronbach's alpha = .864).
- Focused instruction: This mediating variable was constructed using five items such as: "My instructional strategies enable students to construct their own knowledge" and "I focus on developing a deep knowledge of the core subjects that I teach" (Cronbach's alpha = .833). Individual teacher responses from each school were aggregated to the building level in order to link them with student achievement data, which was only available for buildings. This set of loadings appears to reflect the teachers' commitment to higher order learning

combined with an emphasis on maintaining student engagement with very specific learning activities. It corresponds to the emphasis in the instructional literature on teacher's responsibility for managing time in classrooms.[8]

- Teacher's professional community: This construct was based on individual teacher responses on 13 items (alpha = .884), which were aggregated to the building level. It included three subfactor structures: shared responsibility (5 items, alpha = .917), reflective dialogue (4 items, alpha = .836), and deprivatized practice (4 items, alpha = .861). These subdimensions emerged from a factor analysis of items that measure professional community and were derived from previous instruments (Bryk et al., 1999; Lee & Smith, 1995; Louis & Marks, 1998).

  The survey items for these constructs are shown in Table 1.
- Dependent variable: For academic achievement, we used school-level student achievement because individual student achievement was not available from all states in the sample. This dependent variable was based on aggregate student achievement of language arts proficiency over 2 years (i.e., from 2005 to 2007).[9]
- Exogenous observed variables: In addition to the variables that were the primary focus of our analysis, we included two key school characteristics which could have a significant impact on academic achievement. First, the type of school by building levels was employed: elementary (48.4%), middle/junior high (30.3%), high school (21.3%). Second, the percentage of students eligible for free and reduced lunch price was included to reflect the level of school poverty.

Analytical strategy

Data were analyzed using structural equation modeling (SEM). Amos 18 software was used for SEM analysis. Through SEM, we sought to test our proposed model representing conceptual relationships between district influences and teachers' experience of their work lives and examined how those structural relationships are associated with student achievement. We did so by focusing particularly on examining the indirect effects of district policies and practices on student achievement through the two mediating variables (i.e., focused instruction and teacher professional community). Consequently, the statistical evidence of mediating effects was explored and tested using the Sobel's formula (1982).

Because some participants' responses were not available in the data, we employed full-information maximum-likelihood (FIML) estimation to address some of the variables having missing values, ranging from 0.8 to 13.1%. FIML has been identified to be efficient for incomplete data in that FIML estimates are less biased than listwise deletion or pairwise deletion (Little & Rubin, 1989; Muthen, Kaplan, & Hollis, 1987; Schafer & Olsen, 1998). With respect to the normality assumptions of the FIML estimation, we checked kurtosis and skewness of all the variables in the model, following a widely used guideline of normality (Curran, West, & Finch, 1996). Although a few variables were somewhat skewed based on a criterion of skewness less than 2, overall, the criterion of kurtosis (less than 7) and skewness was met.

Several key indices were used to assess model fit. These included chi-square test statistic, root-mean-square-error of approximation (RMSEA), and comparative fit index (CFI). In particular, we relied more on standard cutoff recommendations for

Table 1. Scaled items for analysis.

Variables	Survey items	Alpha
District networked community	• NC1: District personnel procedures help promote and retain our best staff • NC2: Our district fosters the flow of ideas throughout the district • NC3: Our district supports the conditions in schools for teacher collaboration • NC4: Our district provides multiple opportunities for principal and teacher collaboration • NC5: I know about what's happening in other schools in the district	.892
District use of targets & data	• TD1: Our district incorporates student and school performance data in district-level decision making • TD2: Our district assists schools with the use of student and school performance data for school improvement planning • TD3: The district uses student achievement data to determine teacher professional development needs and resources	.864
Focused instruction	• FI1: My instructional strategies enable students to construct their own knowledge • FI2: I maintain a rapid pace of instruction in my classes • FI3: Disruptions of instructional time are minimized • FI4: Most students in my class are capable of taking charge of their own learning in age-appropriate ways • FI5: I focus on developing a deep knowledge of the core subjects that I teach	.833
Teacher professional community		.884
Shared responsibility	• SR1: Our student assessment practices reflect our curriculum standards • SR2: Most teachers in our school share a similar set of values, beliefs, and attitudes related to teaching and learning • SR3: Teachers support the principal in enforcing rules • SR4: How many teachers in this school feel responsible to help each other improve their instruction? • SR5: How many teachers in this school take responsibility for improving the school outside their own class?	.917
Reflective dialogue	• RD1: How often in this school year have you exchanged suggestions for curriculum materials with colleagues? • RD2: How often in this school year have you had conversations with colleagues about the goals of this school? • RD3: How often in this school year have you had conversations with colleagues about development of new curriculum? • RD4: How often in this school year have you had conversations with colleagues about what helps students learn best?	.836
Deprivatized practice	• DP1: How often in this school year have you invited someone in to help teacher you class(es)? • DP2: How often in this school year have you had colleagues observe your classroom? • DP3: How often in this school year have you received meaningful feedback on your performance from colleagues? • DP4: How often in this school year have you visited other teachers' classrooms to observe instruction?	.861

the RMSEA and CFI (Fan & Sivo, 2007; Hu & Bentler, 1999) rather than chi-square statistic, which is sensitive to sample size (Bentler, 1990a). For the RMSEA, values less than .05 and .08 suggest a good model fit and an acceptable model fit, respectively. For the CFI, an important index for studies with relatively small samples (Bentler, 1990b), values greater than .95 and .90 indicate goodness of fit and acceptable fit, respectively. Based on these criteria, we tested our proposed model.

Finally, by examining several specific propositions about paths in the model, we investigated competing models having a nested structure of our proposed model by using chi-square tests.

Results

Descriptive statistics

Table 2 provides a correlation matrix among the variables included in the analysis (for other descriptive statistics, see Appendix 2). Notably, district policies and practices were not significantly associated with student achievement scores, suggesting that, as we assumed, district effects on student achievement would be mainly indirect. Indeed, principals' perceptions of district policies were significantly associated with teachers' responses of focused instruction that was associated with student achievement scores. This indirect linkage between district policies and practices and student achievement was further investigated with structural equation modeling.

Structural equation modeling

The confirmatory factor analysis measurement model, consisting of the four constructs, was analyzed. Results indicated that all the indicator variables loaded significantly on their respective factors with the CFI of .942 and $\chi^2 = 94.0$, $df = 48$ (see Appendix 3 for more details about the measurement model).

Based on the measurement model, we constructed our structural model. Reflecting our conceptual framework discussed earlier, several assumptions were made in the structural model:

- As illustrated earlier in Figure 1, we assumed that both district networked community and district use of targets and data might influence teachers' focused instruction by creating conditions that stimulate teachers to develop particular instructional behaviors.
- In a similar vein, we assumed that those district policies and practices might have an impact on teacher professional community. In other words, we assumed that the district policies and practices could have an impact on adult relationships in schools.
- Consequently, we included the two important endogenous variables reflecting teachers' practices that are expected to mediate the effects of those district policies and practices on student achievement.
- We assumed that school poverty might have a direct effect on focused instruction and student achievement. In addition, we assumed that building level might have a direct effect on teacher professional community. However, it was not assumed to be significantly associated with focused instruction based on existing research (e.g., Louis, Dretzke, & Wahlstrom, 2010).

Table 2. Correlation matrix among variables in the model.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Student achievement														
2. District networked community (NC-A)	−.014													
3. District networked community (NC-B)	.067	.711**												
4. District networked community (NC-C)	.032	.774**	.750**											
5. District use of data in decision making (TD1)	−.044	.455**	.522**	.524**										
6. District assistant to schools with data use (TD2)	−.124	.467**	.488**	.595**	.777**									
7. District data use for professional development (TD3)	−.136	.495**	.466**	.575**	.596**	.694**								
8. Shared responsibility (SR)	.250*	.062	.114	.146	.083	.153	.137							
9. Reflective dialogue (RD)	.116	.098	.026	−.001	.136	.137	.129	.482**						
10. Deprivatized practice (DP)	.082	−.045	−.171	−.064	−.024	.155	.098	.254**	.411**					
11. Focused instruction (FI-A)	.190†	.216*	.167	.162	.025	−.016	−.014	.602**	.356**	.155				
12. Focused instruction (FI-B)	.121	.269**	.234*	.232*	.047	.093	.141	.575**	.397**	.193*	.738**			
13. Focused instruction (FI-C)	.096	.132	.133	.224*	.108	.168	.143	.479**	.289**	.357**	.618**	.668**		
14. Building level	−.120	.055	−.030	−.014	.026	−.066	.024	−.493**	−.275**	−.172	−.388**	−.290**	−.361**	
15. School poverty	−.356**	−.129	−.084	−.064	.104	.187*	.141	.041	.063	.216*	−.256**	−.151	−.064	−.239**

Note: $^{**}p < .01$, $^{*}p < .05$, $^{\dagger}p < .06$ (2-tailed). The acronyms in the parentheses represent indicator variables illustrated in Appendix 3. As mentioned earlier, the items of district networked community and focus instruction were randomly parceled into three indicator variables. The items of teacher professional community were also parceled into three indicator variables according to its subfactor structures.

- While we assumed that teachers' focused instruction may have a direct effect on student achievement, we assumed that teacher professional community would not have a direct effect on students: Students experience classrooms but not conversations among teachers.
- Finally, we made building level uncorrelated with the exogenous latent variables because there were few empirical studies demonstrating the relationship between building level and the exogenous latent variables, and also there were no significant correlations among them (see Table 2).

Alongside this hypothesized model, we further explored other alternative or competing models (McDonald & Ho, 2002). We tested significance on differences between our proposed model and alternative models using chi-square statistics since the proposed model was nested in the alternative models, illustrated in Figure 2.

Specifically, we tested the validity of the proposed model by examining two specific propositions about paths. First, we investigated an alternative model (Model 1) by adding a structural path from school poverty to teacher professional community in Figure 2 in that one may argue that school poverty influences not only student achievement but also teachers' perceptions of professional community. Additionally, we added a structural path from building level to focused instruction (Model 2) because there might be differences in instructional behaviors by building levels. Notably, such tests were conducted not for exploring a sequence of models based on model-modification indices but for examining the validity of our proposed model (MacCallum, Roznowski, & Necowitz, 1992).

As presented in Table 3, chi-square statistics indicate that there were no significant differences between the proposed model and the competing models. Rather, the proposed model demonstrated a slightly better model fit with model

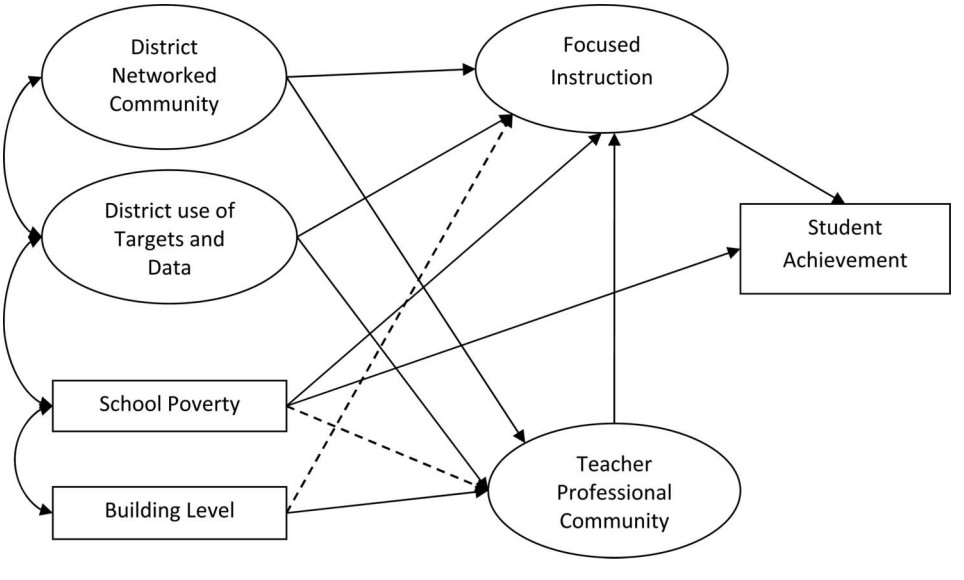

Figure 2. Competing models with dotted structural paths.

parsimony. With respect to model fit, the RMSEA values of the proposed model were .077; the CFI values were .933. Based on the standard cutoff recommendations described earlier (Fan & Sivo, 2007; Hu & Bentler, 1999), the indices showed that the overall model fit is acceptable.

Figure 3 presents SEM results of the proposed model with standardized beta coefficients, r squared, and correlation coefficients (see also Appendix 4 for details about path coefficients, standard errors, and p values). As illustrated in Figure 3, the standardized coefficients were statistically significant of $p < .05$ for all except two paths in the model; the two paths were (1) district networked community → teacher professional community and (2) district use of targets and data → teacher professional community.

We interpret the results of structural relationships among variables as follows. First, the model suggested that there was an indirect relationship between district networked community and student achievement, as district networked community had a significantly positive effect on focused instruction (.37, $p = .003$) and focused instruction had a significantly positive effect on student achievement (.20, $p = .041$).

Table 3. Investigating specific propositions.

Model		*df*	CFI	RMSEA
Proposed model	139.4	81	.933	.077
Model 1	138.6	80	.933	.078
Model 2	138.6	79	.932	.079

Note: CFI (comparative fit index); RMSEA (root-mean-square-measure error of approximation).

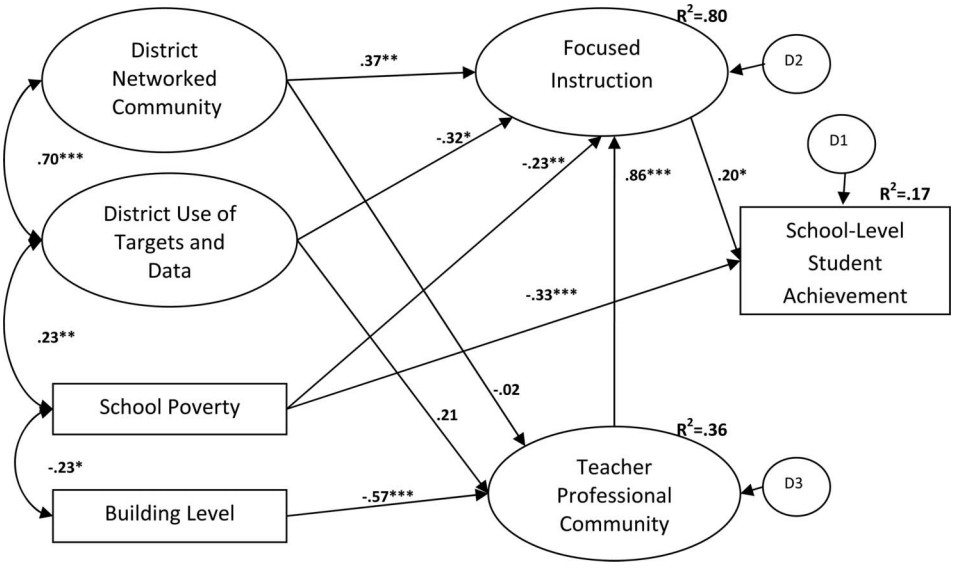

Figure 3. Structural equation modeling testing district effects on student achievement. Note: ***$p < 0.001$, **$p < 0.01$, *$p < .05$. For a simplified illustration, the factor loadings in the measurement model were omitted. For details about the measurement model, see Appendix 3.

To confirm the indirect effect, the Sobel test was applied using the following formula (Sobel, 1982).[10]

$$z = a \times b \Big/ \sqrt{(b^2Sa^2 + a^2Sb^2)}$$

where a is the unstandardized path coefficient from district networked community to focused instruction (.116), Sa^2 is the standard error of a (.039), b is the unstandardized path coefficient from focused instruction to student achievement (11.254), and Sb^2 is the standard error of b (5.502). The Sobel test supported the indirect effect of district networked community on student achievement: $z = 1.685$, $\alpha < .10$. While it was significant at the level of $\alpha < .10$ (if $z = 1.96$ or higher, $p < .05$), it might still be important given the relatively small sample size in this study.

Second, the model also suggested the indirect relationship between district use of targets and data and student achievement through focused instruction. While significant, unlike our assumption, the effect of focus of targets and data use was negative ($-.32$, $p = .013$). Using the Sobel test noted above, the indirect effect was tested: $z = -1.699$, $\alpha < .10$. Again, it was significant at the level of $\alpha < .10$, suggesting that it might have a potentially significant effect considering the relatively small sample size. Indeed, when we estimated the required sample size to achieve statistical power of .80 for our model by specifying a null and alternative value of RMSEA fit index (i.e., $\varepsilon 0 = .05$ and $\varepsilon a = .077$) at the level of $\alpha = .05$ (MacCallum, Browne, & Sugawara, 1996), the required sample size turned out to be 150. This implies that the indirect effects of district-related variables could be significant at the level of $\alpha = .05$, if the model would have included slightly more schools than the sample schools in the final analysis (i.e., 122).[11]

Third, while we assumed the relationships between the two district-related variables and teacher professional community, however, district networked community did not have a significant effect on teacher professional community. Neither did district use of targets and data have a significant effect on teacher professional community, unlike our assumption.

Fourth, teacher professional community had a strong effect on focused instruction (.86, $p < .001$). It also had an indirect effect on student achievement, given its effect on instruction.

Fifth, with respect to the two school characteristics, building level had a significantly negative effect on teacher professional community ($-.57$, $p < .001$), and school poverty, as expected, had significantly negative effects on focused instruction ($-.23$, $p = .003$) and student achievement ($-.33$, $p < .001$), respectively.

Finally, 17% of the variance in student achievement was explained by the model.

Discussion and conclusion

The primary focus of our analysis was to examine district effects on student achievement. Through our SEM analysis, we also sought to illuminate how they influence student achievement.

With respect to district effects on student achievement, we found that there are indirect effects on student achievement. Specifically, *within-district networked community, as assessed by principals, has a significantly positive effect on teachers' reported instructional behaviors (focused instruction), that is, in turn, significantly*

associated with student achievement. Considering the meanings embedded in the indicator variables for district networked community (e.g., fostering the flow of ideas related to student learning, providing multiple opportunities for principals and teacher collaboration, sharing information about schools in the district), district-wide practices and efforts to build professional community seem to mold certain school conditions that positively stimulate the kind of instruction that is linked to student learning. In other words, our finding demonstrates that district-wide practices related to developing networked professional relationships between schools and among teachers and school leaders shape teachers' instructional behaviors.

This finding deepens previous case study findings regarding district effects that have focused on district coaching and development programs that serve teachers (Coburn & Talbert, 2006; Stein & Coburn, 2008; Togneri & Anderson, 2003). The important implication is that, as Firestone (2009) and others have suggested, local authority culture needs to change if these units are to have any significant impact on student achievement. The needed change requires creating ties that confront the assumption that change occurs "one classroom at a time" toward the perspective articulated by Granovetter (1973) as "the strength of weak ties" in spreading innovation, and currently labeled as networked learning communities (Earl & Katz, 2006).

At the same time, however, our data suggest that there is a negative district effect on teachers' instructional behaviors. Specifically, *district use of targets and data (i.e., data use in decision making, achievement data use for school improvement planning, district assistant to schools or teacher professional development based on performance data) seems to generate certain negative pressures on teachers within the current context of accountability*. This finding implies that the pressures of strong accountability from districts and an emphasis on data-driven decision making may not, in the absence of other cultural changes, have the desired effect of motivating change.

We hasten to point out that this does not imply that in "the real world" districts should avoid setting policies about learning targets or expectations that schools will use data for decisions. Some indicators from the two district-related latent variables had cross loadings, which led to the high correlation between the two district-related latent variables.[12] Thus, our finding is probably best interpreted to mean that districts should not create strong pressures for targeted achievement gains and data use as the *primary or only* strategy for improving student learning. Rather, once these policies and practices are in place, the district should also consider how to support schools in carrying them out. Our analysis indicates that networked learning communities may provide one such approach; other analyses (Louis, Leithwood, et al., 2010) suggest that effective professional development for administrators might be another avenue. In the end, we conclude that pressure for data use without support will not yield the desired results.

We wish to note that the indirect effects of the two district-related variables on school-level student achievement were significant at the level of $\alpha < .10$. This suggests that, although the indirect effects have a limitation in terms of statistical power to some extent, still they may have potentially significant effects, given the relatively small sample size. Another somewhat unexpected finding is that there is *no significant linkage between the two district variables and teacher professional community*.

There are two possible reasons for this. First, we know from previous analyses that teachers' professional community is most strongly affected by the presence of

shared and instructional leadership from the principal (Louis, Dretzke, & Wahlstrom, 2010). Unless the school leader is able to shape district policies and practices in ways that change the leadership patterns within the school, limited change occurs. Thus, we suspect that there might be other potentially influential district policies and practices (e.g., district support for professional development of principals as instructional leaders) that could be associated with teacher professional community. Future research is needed to investigate this linkage. Second, it is possible that, in many districts, the emphasis on data use and targets for improvement were not embedded in a supportive professional development program that encouraged teachers to design and use data other than annual standardized tests. The latter, whether government mandated or imposed by the district provides information that teachers often find less useful than other sources of knowledge about student learning (Ingram et al., 2004). We note that the relationship between district targets/data use policies and teachers' professional community is positive and is considerably stronger for elementary schools than secondary schools.[13] This suggests that a district's focus on data may have the effect of stimulating more discussion among teachers which, when combined with other policies practices that we have not measured here, might increase the indirect effects on student learning.

Finally, before discussing the implications of this study, we acknowledge its limitations. First, despite our effort to maintain a parsimonious model (e.g., item parceling), the number of variables employed in the final analysis (i.e., 34) is still large given the relatively small sample size (see Bentler & Chou, 1987). The small sample size resulted in a number of nonsignificant results that might emerge as more important in a larger study. Second, as noted in the above discussion, there are clearly variables missing from the SEM model that might be important. In addition, our data are cross-sectional, and we might find more significant effects with a longitudinal design (see, e.g., Heck & Hallinger, 2009). Finally, since we are investigating district networking, an analysis of actual network participation and network density would be appropriate. However, the structure of our data set does not permit this.

Implications for policy and practices

A number of implications for policy and practice emerge from our analysis of the results of a national sample of "ordinary" schools in the United States.

First, local education agencies should spend less time ensuring that schools have large amounts of annual standardized test data and more time helping school leaders and teachers figure out how such data might help them make a difference in the classroom experiences of their students. There are a number of relevant guides to improved practice in this area (Earl & Katz, 2006; Love, Stiles, Mundry, & DiRanna, 2008), as well as established improvement programs that are based on using data to solve problems as well as find them (Yeh, 2006). In particular, the challenge for local education agencies is to help school leaders and teachers to understand the implications of such evidence for their instructional improvement efforts. Although many local education agencies are developing that competence, relying on internal expertise is not reasonable in most cases. Smaller local agencies or those located in countries where there is a weak tradition of districts supplying direct coaching or professional development suggest that there is probably a need to develop support systems for data use that go beyond the district if the promise of data-driven decision making is to be realized.

Second, local education agencies should pay more attention to the development of strong cultures that create professional communities within schools, but also between schools. This study establishes a clear link between the development of networked learning communities and student achievement. The message is that spending time on culture building, although it is often considered a ''soft'' improvement in an era of strict accountability by the numbers, may pay off in the end. In particular, where local agencies wish to promote data-driven decision making, they should consider making this a priority for district-wide learning communities that involve school leaders, as well as promoting accountability at the building level.

Finally, there is evidence that secondary schools are exposed to the same opportunities for networking and pressures for data use as elementary schools, but, at least in the United States, they have been less successful in translating these into within-school professional communities and improved instruction. Professional communities in secondary schools are typically centered on disciplinary subjects, and even within disciplines are more likely to seek professional communities with others who teach the same subjects. This suggests that local education agencies should attend to the need for differentiated experiences and support for secondary schools if data-based decision making is to have an impact. Clearly, this is another area where networked learning communities, both within and across districts, may be helpful.

Our data come from a single country which, although large and varied, may not reflect either the practices or outcomes of local education agencies in other settings. However, there is no reason to believe that the underlying relationships that we have explored are not applicable to other contexts in which responsibility is shared between the central government, local government, and individual schools. The arrangements to provide support for setting targets, data use, and developing more opportunities for meaningful discussions about how to achieve common goals will vary among countries. In large urban and suburban districts in Ontario, internal expertise is abundant, and there are many schools that can be linked; in sparsely populated northern Sweden, agencies other than the small municipalities will need to provide the incentives and opportunities. We suggest, however, that the sometimes fruitless discussions about whether local education agencies should exist or how they should govern be abandoned in favor of further investigations of how to make their role most meaningful to school improvement and student learning.

Notes

1. Our research was funded by the Wallace Foundation. This article presents only a small window into the large and complex project.
2. Throughout this article, we will use the general term, local education agency (LEA), to denote recognized units that exist between the national/state/provincial governments and have some responsibility for the management of individual schools. This could include Swedish municipalities as well as Dutch school boards, which are private but publicly funded entities that do not have a geographically defined catchment area. We will also use the term district, which is the name for LEAs in North America and some other countries.
3. Professional community is closely associated with organizational learning, and the term professional learning communities has become a common short hand among practitioners and some scholars
4. Others argue that the paradigm for effective teaching has fundamentally changed, in large measure because of the demand for adaptive learning capacities in the workforce and society in general (Cheng & Mok, 2008).

5. Frequently cited investigations of leadership effects often use only one type of school (Bryk & Schneider, 2002; Cascadden, 1998; Harris, 2002). Those that use samples from all levels are based on a small number of cases (Marks & Printy, 2003), or convenience samples from a single district (Leech & Fulton, 2008; Leithwood & Jantzi, 2000).
6. Because there were seven schools where principals did not respond to the principal survey, seven assistant principals' responses were alternatively used for the schools.
7. According to Marsh, Hau, Balla, and Grayson (1998), it could perform best especially when a factor has relatively many items (e.g., more than 12 items).
8. This measure was shown in a previous paper (Louis, Dretzke, & Wahlstrom, 2010) to be associated with student achievement.
9. The correlation coefficient of language arts proficiency between 2005/6 and 2006/7 was .936 ($p < .01$). We conducted preliminary analyses with mathematics achievement, and similar results emerged.
10. The Sobel test is based on the assumption that the mediating effect of $a \times b$ is normally distributed. In this regard, bootstrap methods, suggested by Shrout and Bolger (2002), can be alternatively used to test mediating effects.
11. We used a SAS program to calculate this.
12. We admit that using indicators with cross loadings is not recommended in general. Nonetheless, consistent with the primary purpose of the study, they were included in the analysis after assessing the two factors' interim reliability with and without those indicators (Pett, Lackey, & Sullivan, 2003).
13. We have not presented the analyses (i.e., multiple group SEM) separately for elementary and secondary schools because of the small Ns. These remarks are intended as suggestive of the need for further investigation.

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Appendix 1. Correlation matrix among factors

	1	2	3	4	5
1. District networked community					
2. District use of targets & data	.622**				
3. Focused instruction	.235*	.092			
4. Shared responsibility	.108	.119	.600**		
5. Deprivatized practice	−.087	.080	.240**	.311**	
6. Reflective dialogue	.053	.175	.424**	.582**	.525**

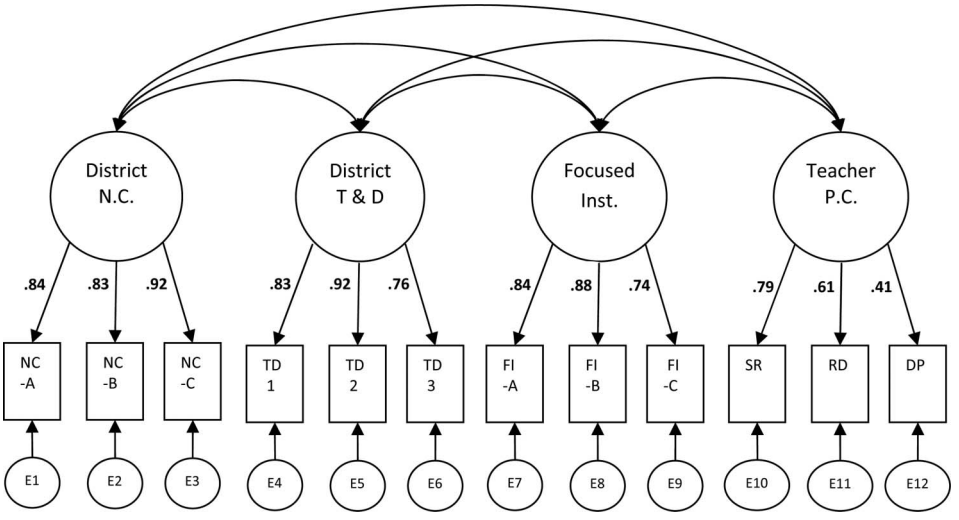
Note: $^{**}p < .01$, $^{*}p < .05$ (2-tailed).

Appendix 2. Descriptive statistics

	Min.	Max.	*M*	*SD*
Student achievement	17.55	98.55	71.23	20.20
District networked community (NC-A)	1.00	6.00	4.52	1.34
District networked community (NC-B)	1.00	6.00	4.20	1.18
District networked community (NC-C)	1.00	6.00	4.41	1.19
District use of data in decision making (TD1)	1.00	6.00	5.19	1.02
District assistant to schools with data use (TD2)	1.00	6.00	4.94	1.09
District data use for professional development (TD3)	1.00	6.00	4.32	1.46
Shared responsibility (SR)	3.11	5.42	4.58	.41
Reflective dialogue (RD)	3.32	4.61	3.98	.28
Deprivatized practice (DP)	1.75	3.23	2.39	.34
Focused instruction (FI-A)	3.04	5.19	4.30	.41
Focused instruction (FI-B)	4.30	5.61	4.93	.27
Focused instruction (FI-C)	4.18	5.42	4.79	.25
Building level	1.00	3.00	1.73	.79
School poverty	.0027	.99	.44	.26

Note: The acronyms in the parentheses represent indicator variables illustrated in Appendix 3.

Appendix 3. Estimates of CFA measurement model coefficients



Note: All estimates above are statistically significant at the $p < .001$ level. As described earlier, three factors were based on random item parceling as follows: NC-A = NC3, NC-B = (NC2 + NC5)/2, NC-C = (NC1 + NC4)/2, FI-A = FI4, FI-B = (FI3 + FI15)/2, FI-C = (FI1 + FI2)/2, SR = (SR1 + SR2 + SR3 + SR4 + SR5)/5, RD = (RD1 + RD2 + RD3 + RD4)/4, DP = (DP1 + DP2 + DP3 + DP4)/4.

Appendix 4. Path coefficients, standard errors, and *p* values

Effect	Standardized estimate	*SE*	*p* value
District networked community → Focused instruction	.37	.039	.003
District networked community → Teacher professional community	−.02	.018	.878
District use of targets and data → Focused instruction	−.32	.049	.013
District use of targets and data → Teacher professional community	.21	.022	.177
School poverty → Focused instruction	−.23	.101	.003
School poverty → Student achievement	−.33	6.98	.001<
Building level → Teacher professional community	−.57	.027	.001<
Teacher professional community → focused instruction	.86	.562	.001<
Focused instruction → Student achievement	.20	5.50	.041