An Exploratory Analysis of Formal School Leaders' Positioning in Instructional Advice and Information Networks in Elementary Schools

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The Distributed Leadership Studies
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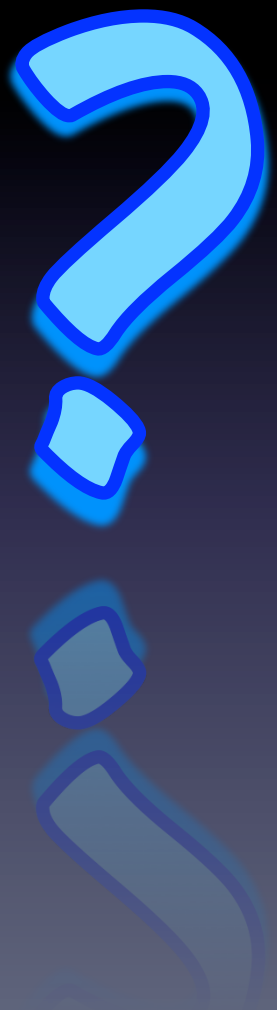
Formal Organizational Structure & Advice & Information Interactions

- Teachers more likely to seek advice from others of **same gender and race**.
- **Prior tie** strongly associated with having a current tie
- **Formal** leaders more likely to provide advice or information
- Teachers in the **same grade** more likely to receive or provide advice or information
- Teachers more likely to seek advice about a subject from teachers who reported **more PD** in that subject

Spillane, J. P., Kim, C. M., & Frank, K. A. (2012). Instructional advice and information seeking behavior in elementary schools: Exploring tie formation as a building block in social capital development. *American Educational Research Journal*.

Research Questions

- How are formal school leaders positioned in their school's instructional advice and information networks for language art and mathematics?
- Are full-time school leaders positioned differently than part-time school leaders?



Anchoring the Work

- Assumptions
  - Advice and information as building blocks in developing knowledge about teaching
  - Evidence of selective 'recoupling' of the school's formal structure with both policy and teaching

- Conceptual Framing
  - A distributed perspective on school leadership and management
  - Examining relations between the formal and informal organization
  - Relational structure – the interactions and interdependencies among people (Lopez and Scott 2000)


POLICIES
SCRIPTS
TOOLS
PROCEDURES
STRUCTURE
CONCEPTS
POSITIONS
FORMAL
STRUCTURE
POLICIES
ORGANIZATIONAL
POSITIONS
FRAMES
TOOLS
NORMS
REGULATIONS
PROTOCOLS
FRAMES
WORK
POLICIES
CONCEPTS
SCRIPTS
RULES
PROGRAMS
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ROUTINES
PROCEDURES
STRUCTURE
RULES
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FRAMES
WORK
RULES
STRUCTURE

Research Approach: Overview

- Social Network Analysis Methods
- Survey data from 30 elementary schools in a mid-sized urban district
- Similarities and differences in formal leaders positioning in the instructional advice and information networks
- Survey data gathered in the spring of 2005 and spring of 2007
- 89% response rate (ranging from 66% to 100% by school) in 2005, 83% response rate (ranging from 63% to 100% by school) in 2007

Research Approach: Using Social Network Analysis

TABLE 1

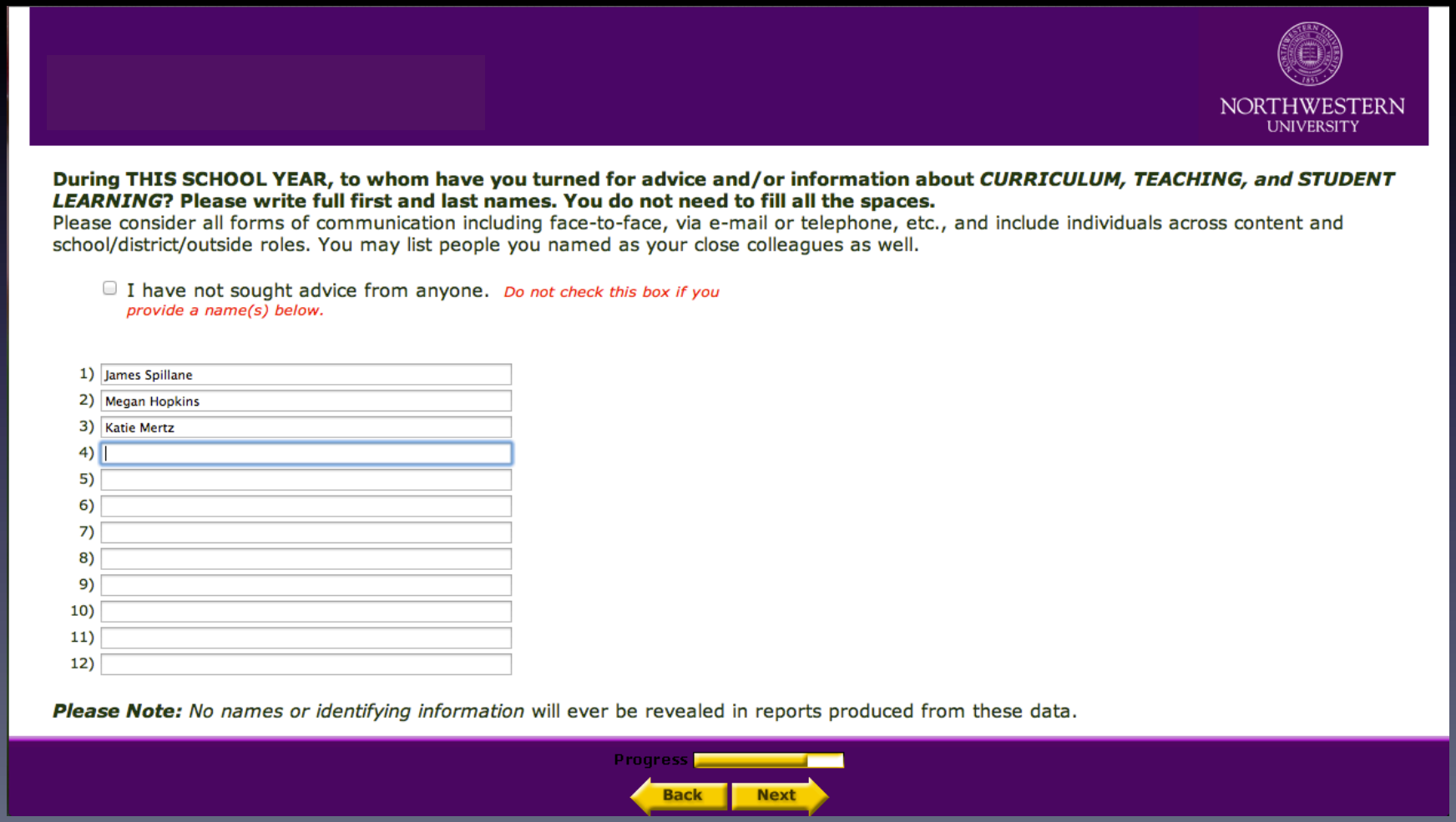
Student and School Staff Characteristics in 30 Elementary Schools in 2006–7

	Minimum	Maximum	Mean	SD
Student:				
Student enrollment	354	870	540	132
African American students (%)	0	90	58	29
White students (%)	0	70	24	24
ELL students (%)	0	10	1	3
Free/reduced lunch (%)	10	90	59	24
School staff:				
Full-time staff (%)	89	100	96	3
Female staff (%)	80	98	93	5
White staff (%)	32	93	71	17
Experience (years)	9	19	13	3

NOTE.—ELL = English language learner. Only one school did not meet AYP.

Social Network Instrument

Screen shot from SSQ – Math Advice Questions Page 1



Measures

- Formal Organizational Structure – formally designated position
  - Full-time; part-time, teacher
- Relational Structure or Informal Organization – centrality
  - Degree centrality
  - Betweenness → $C'_B(n_i) = \frac{C_B(n_i)}{(g-1)(g-2)/2}$
  - Closeness → $C_C(n_i) = \frac{(g-1)}{\left[\sum_{j=1}^{g} d(n_i, n_j)\right]}$
- Normative Structure
  - Collective responsibility, teacher-teacher trust, alignment

Data Analysis

- To explore the positioning of formal leaders in their school's instructional advice and information network, we calculated degree centrality, betweenness, and closeness in 2007 using STATA

- To identify formal school leaders' membership in and distribution across subgroups, we identified non-overlapping subgroups in the networks in 2005 and 2007 using the network clustering algorithm software KliqueFinder (Frank 1995).

- To examine whether or not formal leaders' distribution across subgroups is related to the school's current (2007) normative structure, we used two-level multilevel models (HLM) with subgroups nested in schools.

- To investigate whether or not formal leaders' distribution across subgroups is related to change in schools' normative structure, we used multiple regressions with the same two dummy variables at the school level

The Principal Plus Other Leaders

- 31% of respondents had formal leadership position; on average 13 formal school leaders per school (ranging from 6 to 19)
- 26% reported being full-time leaders; on average schools had 3.3 full-time leaders, ranging from 1 to 8.
  - Of the full-time leaders, most were principals (n=30, 31%), assistant principals (*n*=19, 19%), and school reform coaches (*n*=7, 7%)
  - 41% of full-time leaders reported holding two or more formal positions
- Of the part-time leaders:
  - Mentor teachers (54%) and coaches (18%)

The Principal Plus

- Principals were not prominent in their schools' networks;
  - 12 principals in language arts networks, 9 in math networks
  - Principal network participation positively associated with network density in language arts (r=0.77, p<0.001) and mathematics (r=0.82, p<0.001)
- Factoring in other formal leaders
  - 49% of the full-time formal leaders were isolates in language arts networks, compared with 26% of part-time formal leaders
  - Being a full-time or part-time was associated with being an isolate in both the language arts (x^2=9.8, p<.01) and mathematics (x^2=28.3, p<0.001)

Formal Leaders: Full-time and Part-time

TABLE 2

Means and Standard Deviations of Centrality (Degree, Betweenness, and Closeness) by Position, 2007

	Degree	Betweenness	Closeness	*N*
Language arts:				
F	.045	.028	.028	
	(.083)	(.060)	(.012)	97
P	.040	.018	.031	
	(.046)	(.041)	(.013)	276
F + P	.042	.020	.030	
	(.058)	(.047)	(.013)	373
T	.028	.011	.029	
	(.028)	(.029)	(.013)	845
Total	.032	.014	.029	
	(.040)	(.036)	(.013)	1,218
Mathematics:				
F	.019	.011	.026	
	(.031)	(.028)	(.010)	97
P	.045	.024	.031	
	(.050)	(.046)	(.013)	276
F + P	.038	.021	.030	
	(.047)	(.042)	(.013)	373
T	.025	.009	.029	
	(.028)	(.022)	(.014)	845
Total	.029	.013	.029	
	(.035)	(.030)	(.014)	1,218

NOTE.—Position: F = full-time formal leaders; P = part-time formal leaders; T = teachers. Standard deviations are in parentheses.

Formal Leaders & Subgroup Membership & Distribution

TABLE 3

Percent (Range) of School Staff in Networks and Subgroups, 2007

	NETWORK CONNECTIONS		NETWORK ISOLATION		SUBGROUP MEMBERSHIP		FLOATERS	
	Language Arts	Math	Language Arts	Math	Language Arts	Math*	Language Arts	Math*
Percent	71	66	29	35	59	56	9	9
Range	(54–84)	(46–86)	(9–59)	(10–63)	(34–81)	(29–81)	(0–30)	(0–27)

* Two schools are excluded in this calculation because KliqueFinder could not identify cohesive subgroups in these schools.

Formal Leaders & Subgroup Membership & Distribution

TABLE 4

Percent of School Staff in Networks by Position, 2007

	Subgroup	Isolates	Floaters	*N*
Language Arts:**				
F	44	50	6	94
P	62	31	7	270
T	60	33	7	828
Mathematics:***				
F	33	57	10	96
P	67	27	6	266
T	52	39	9	830

NOTE.—Position: F = full-time formal leaders; P = part-time formal leaders; T = teachers. One person subgroup (27 for language arts and mathematics networks) and missing cases (5) were excluded in the χ^2 test.

** $p < .01$, χ^2 test.

*** $p < .001$, χ^2 test.

Formal Leaders & Subgroup Membership & Distribution

TABLE 5

Hierarchical Linear Models Results of Norms

	COLLECTIVE RESPONSIBILITY	TEACHER-TEACHER TRUST	ALIGNMENT
	Coefficient and Standard Error		
Fixed effect:			
Level/variable:			
Subgroup (n = 93):			
Prior subgroup norm	.22	.08	.15
	(.14)	(.11)	(.15)
Subgroup size	−.015*	−.01^{+}	−.005
	(.007)	(.006)	(.004)
Formal leaders in subgroup	.07	.13*	.15*
	(.10)	(.06)	(.08)
School (n = 28):			
Intercept	.68	.82^{+}	.96
	(.51)	(.41)	(.62)
Prior school norm	.57*	.60**	.48*
	(.21)	(.19)	(.21)
P in every subgroup	.47**	.36**	.23**
	(.16)	(.10)	(.07)
F and/or P in every subgroup	.33*	.23*	.15^{+}
	(.13)	(.11)	(.07)
	Variance		
Random effect:			
School mean	.06***	.03***	.02**
Subgroup effect	.12	.06	.05
Reliability coefficient	.60	.62	.45

Formal Leaders & Subgroup Membership & Distribution

TABLE 6

Change in Norm from 2005 to 2007 at the School Level

	COLLECTIVE RESPONSIBILITY			TEACHER-TEACHER TRUST			ALIGNMENT		
	B	SE	β	B	SE	β	B	SE	β
Intercept	−.18*	.08		−.20*	.07		−.16*	.05	
P in every subgroup	.34*	.13	.52	.30*	.11	.52	.20*	.08	.48
F and/or P in every subgroup	.26*	.11	.45	.20^{+}	.10	.39	.15^{+}	.07	.40
Adjusted R^2	.20			.18			.15		

NOTE.—School n = 28. B = unstandardized coefficient; SE = standard error; and β = standardized coefficient. Position: F = full-time formal leaders; P = part-time formal leaders. SPSS software version 19 was used for this analysis. We also tested the effect of Title 1 schools in this model, but we did not find a significant relationship. Thus, we excluded the Title 1 variable in the final models.

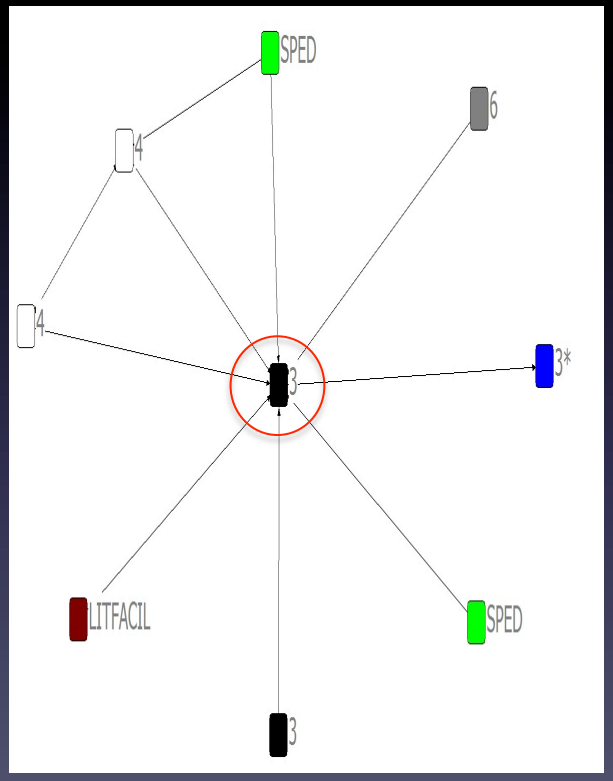
$^{+}p < .10$.

* $p < .05$.

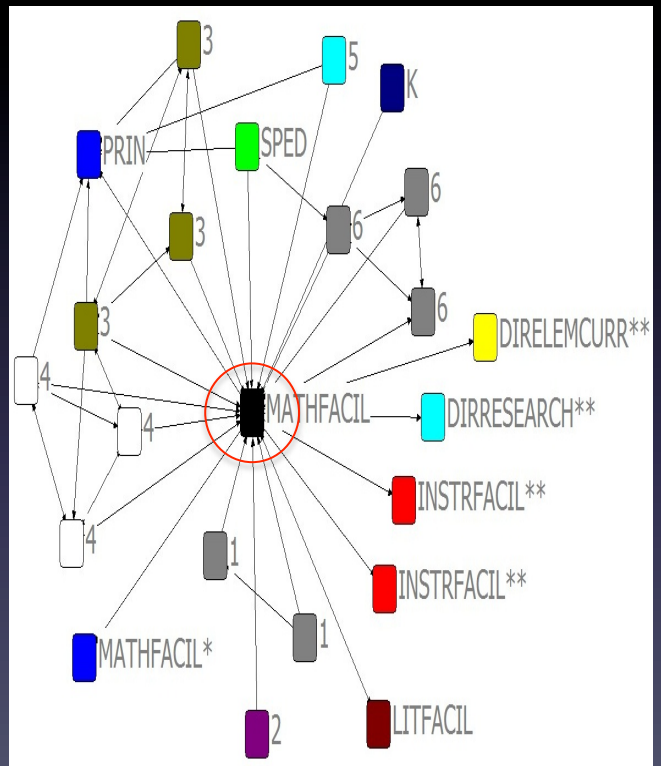
Conclusion

- Key characteristics shaping relations between infrastructure & practice:
  - Anchoring in and alignment with instruciton
  - Cognitive adequacy
  - Consistency
  - Communicability, corruptability, and correctability
  - Authority and power

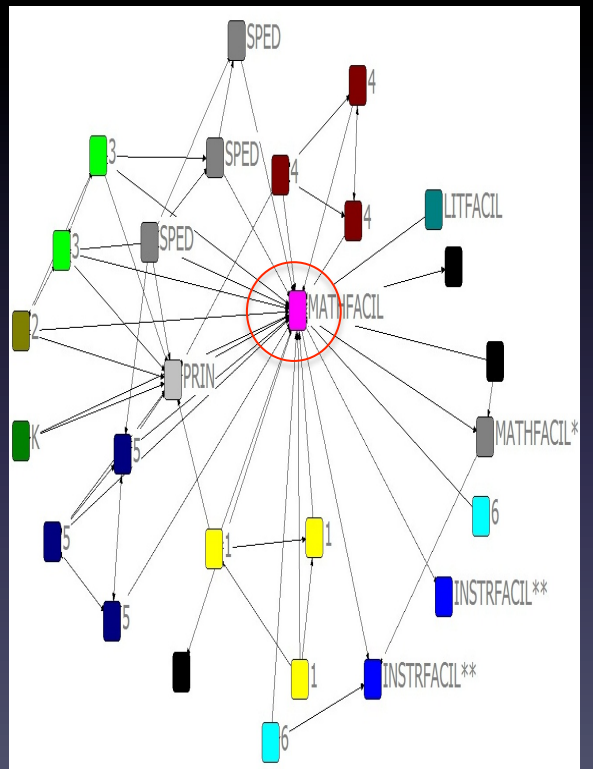
Math Coach (Emily) Facilitates Staff Interactions



2009-10



2010-11



2011-12

Infrastructure Redesign Promoted Advice and Information Seeking in Mathematics

Average In-Degree for Teachers Leaders and Other Teachers, Auburn Park School District

	2009-10	2010-11	2011-12
Toolbox Members (6)	1.60	2.80	2.67
Fundamental Math Participants (9)	4.33	6.00*	6.00
Math Coaches (3)	6.33	16.33**	18.00
Other Teachers (256)	1.54	1.60	1.36

*p<0.05; **p<0.01

Infrastructure Redesign Promoted Brokering in Mathematics

Average Betweenness for Teacher Leaders and Other Teachers, Auburn Park School District

	2009-10	2010-11	2011-12
Toolbox Members (6)	5.00	75.80*	48.86
Fundamental Math Participants (9)	32.44	144.33*	115.42
Math Coaches (3)	38.67	248.67**	222.97
Other Teachers (256)	10.85	24.81*	11.90

*p<0.05; **p<0.01

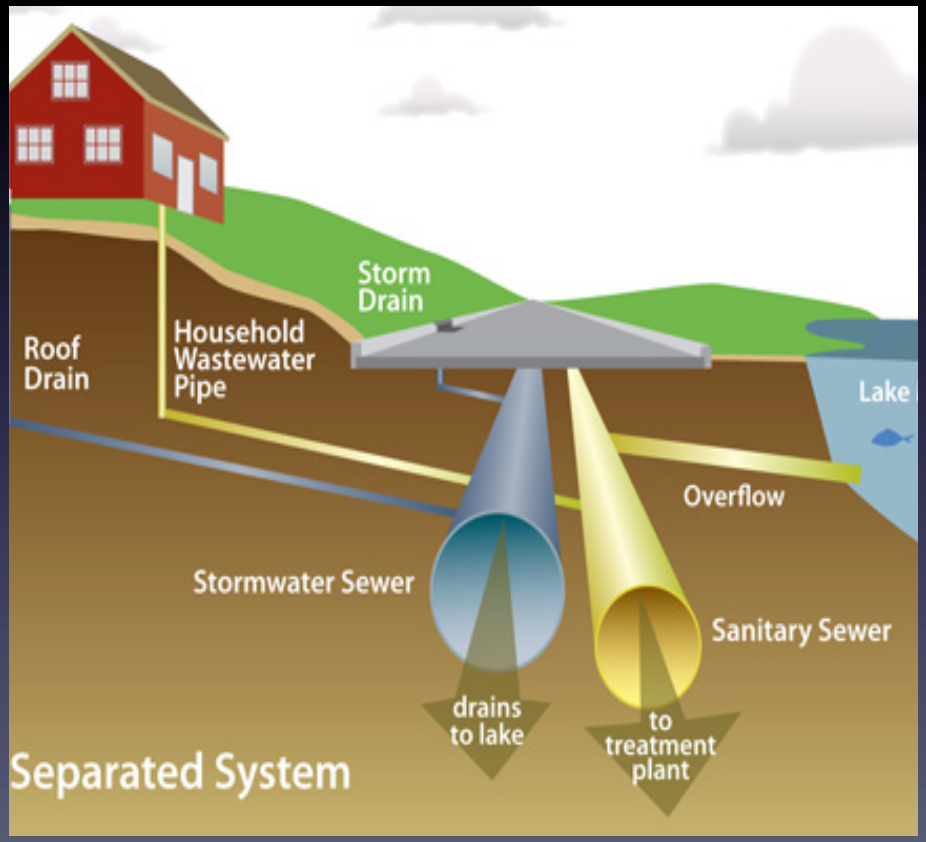
Teacher Leadership as a Coupling Mechanism

Change in Teachers' Beliefs about and Reported Practices in Mathematics

	2009-10	2010-11	2011-12
Beliefs about Mathematics Instruction Mean (SD)	3.35 (0.5)	3.46*** (0.5)	3.51*** (0.5)
Reasoning and Problem-Solving Practices Mean (SD)	2.39 (0.4)	2.52*** (0.4)	2.64*** (0.5)

*p<0.05; **p<0.01

System and Organizational Infrastructure



More at:

http://distributedleadership.org/DLS/Presentations.html

http://www.principalpolicyresearch.org