School-Level Teacher Qualifications and School Environments: Untangling Their Interrelationship for School Improvement.

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The Context for our Research

- **Teacher quality research** has found relationships between teacher qualifications and student performance at both the classroom level and the school level.
- **School effects research** has linked student achievement differences across schools to the strength of school environments.
- This study explores the **link between the collective qualifications of teachers in a school and school environments.**
- The study uses data on public elementary/middle and high schools in Chicago in 2002-2003.

Research Questions

- Are measurable qualifications of teachers (academic capital) at the school level related to school environments?
- If so, do organizational characteristics of schools interact with teacher academic capital to improve student achievement?

Our Data

- **Teacher Qualifications:** Created a school-level Index of Teacher Academic Capital (ITAC) to capture the collective level of academic-oriented preparation of teachers in each school. We used the State of Illinois's teacher service record (TSR) data, the state certification data and ACT data for all teachers in Chicago Public Schools in 2002-2003.
- **School Environments:** Created 5 indicators using teacher and student survey data from the Consortium on Chicago School Research's Spring 2003 surveys. Used factor analysis to combine multiple teacher and student measures provided by CCSR.

Average School-Level Teacher Qualifications by ITAC Range

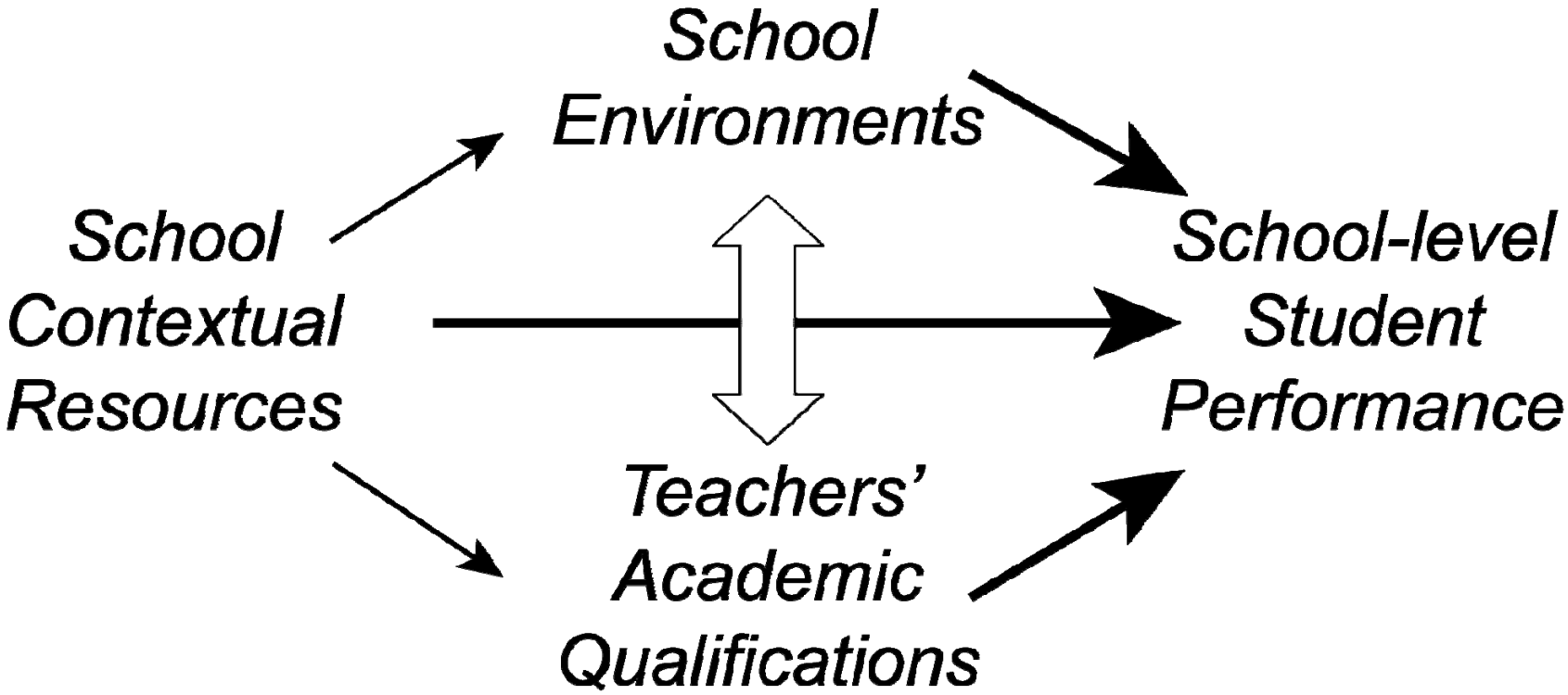
ITAC Components	ITAC ≈ -3 (-3.1 to -2.9) N=12	ITAC ≈ -2 (-2.1 to -1.9) N=42	ITAC ≈ -1 (-1.1 to -0.9) N=133	ITAC ≈ 0 (-0.1 to 0.1) N=412	ITAC ≈ 1 (0.9 to 1.1) N=231	ITAC ≈ 2 (1.9 to 2.1) N=24
Average ACT Composite Score	16.6	17.8	19.2	20.9	22.9	24.8
Average ACT English Score	16.2	17.5	19.4	21.5	23.6	25.6
Average Barron's College Ranking*	2.6	2.8	2.9	3.0	3.2	3.6
% of Teachers Who Failed Basic Skills Test on First Attempt	3.9	0.8	0.6	0.2	0.1	0.0
% of Teachers with Emergency/Provisional Certification	34.7	18.2	9.3	2.9	2.0	1.9

*** Barron's college rankings range from a low of 1 to a high of 6 with 1=Non-Competitive, 2=Less Competitive, 3=Competitive, 4=Very Competitive, 5=Highly Competitive, and 6=Most Competitive.**

Construction of School Environment Factors

School Environment Factor	Measures
Distributed Leadership (Cronbach's alpha = 0.92)	• Teacher Influence • Instructional Leadership • Program Coherence • Teacher-Principal Trust
Parent-School Relations (Cronbach's alpha = 0.88)	• Knowledge of Students' Culture • Parent Involvement in School • Teacher Outreach to Parents • Teacher-Parent Trust
Teacher Professional Community (Cronbach's alpha = 0.94)	• Collective Responsibility • Innovation • Peer Collaboration • Reflective Dialogue • School Commitment • Socialization of New Teachers • Teacher-Teacher Trust
Safety and Order (Cronbach's alpha = 0.67)	• Classroom Behavior • Incidence of Disciplinary Action • Safety

The Conceptual Framework



Adapted from model by Brookover, Beady, Flood, Schweitzer, and Wisenbaker (1979).

Correlations between ITAC and School Environment Factors

	Elementary/ Middle Schools	High Schools
Distributed Leadership Factor	0.19	0.35
Parent-School Relations Factor	0.37	0.53
Teacher Professional Community Factor	0.26	0.48
Safety and Order Factor	0.42	0.67
Overall Climate Measure	0.34	0.59
Number of Schools in Sample	213	34

$p \leq .01$, $p \leq .05$

- Statistically significant correlations between ITAC and each school environment indicator.
- Correlations stronger at the high school level.
- Safety and order highest at both levels.
- Schools with more academically-prepared teachers tend to have more positive school environments as well.

Descriptive Statistics for Elementary/Middle Schools

Numbers in Standard Deviation units unless otherwise indicated.	All Schools in Sample (213)	African American Low SES (62)	African American Moderate SES (32)	Predomin-ately Latino (39)	Predomin-ately Minority (26)	Racially Diverse (18)	Racially Integrated (36)
Community							
SES Factor	-0.15	-0.79	0.26	-0.36	-0.18	0.55	0.47
Teacher Attributes							
ITAC	-1.13	-1.59	-1.79	-0.99	-0.85	-0.31	-0.53
% teachers with ≤ 3 years exp.	0.17	0.17	0.15	0.19	0.19	0.16	0.14
Environment Factors							
Distributed Leadership	0.03	-0.32	-0.26	-0.04	0.17	0.55	0.61
Parent-School Relations	0.15	-0.39	-0.13	0.24	0.18	0.45	1.06
Professional Community	0.02	-0.35	-0.27	0.01	0.17	0.39	0.65
Safety and Order	0.03	-0.81	-0.67	0.52	0.14	0.90	1.06
Overall Climate	0.00	-1.42	-1.22	0.33	0.58	1.56	2.00
Student Achievement							
% meets/exceeds ISAT	42.4	30.2	27.0	40.9	39.8	53.9	66.0
Reading gains (02-03)	0.37	-0.73	0.04	0.33	0.40	1.20	2.19
Math gains (02-03)	0.90	-0.52	0.51	0.95	0.96	1.62	3.23

Descriptive Statistics for High Schools

Numbers are in Standard Deviation units unless otherwise indicated.	All Schools in Sample (N=34)	African American Low SES (N=5)	African American Moderate SES (N=5)	Predominately Latino (N=6)	Predominately Minority	Racially Diverse (N=10)	Racially Integrated (N=8)
Community							
SES Factor	**0.04**	**-0.76**	**0.78**	**-0.08**	—	**-0.19**	**0.72**
Teacher Attributes							
ITAC	**0.05**	**-0.25**	**-0.40**	**0.38**	—	**-0.22**	**0.55**
% teachers with ≤ 3 years exp.	**0.24**	**0.24**	**0.22**	**0.19**	—	**0.17**	**0.18**
Environment Factors							
Distributed Leadership	**-0.52**	**-0.62**	**-0.74**	**-0.38**	—	**-1.08**	**-0.55**
Parent-School Relations	**-1.11**	**-0.45**	**0.21**	**-0.24**	—	**-0.17**	**0.88**
Professional Community	**-0.49**	**-0.98**	**-0.83**	**-0.55**	—	**-0.98**	**-0.83**
Safety and Order	**-0.11**	**-0.79**	**-0.60**	**-0.34**	—	**-0.76**	**1.15**
Overall Climate	**0.15**	**-0.38**	**0.14**	**0.67**	—	**-1.00**	**1.33**
Student Achievement							
% meets/exceeds PSAE reading	**38.5**	**25.8**	**35.1**	**22.1**	—	**37.7**	**61.8**
% meets/exceeds PSAE mathematics	**30.0**	**12.7**	**21.6**	**15.0**	—	**29.6**	**57.7**
N	**34**	**5**	**5**	**6**	—	**10**	**8**

Predicting improvements in student achievement

- We included two additional measures in our regressions
  - % of teachers in each school with ≤ 3 years of teaching experience
  - % of LEP students in each school
- For elementary/middle schools, we use ITBS gain scores in reading and math based on a CCSR-developed measure of individual student growth from the prior year.
- At the high school level, we do not have value-added scores, so we used average school performance in reading and math in 2002-2003, but included a prior 8th-grade achievement score for entering freshmen.

Predicting Student Reading Achievement at the Elementary/Middle School Level

(Numbers in cells are standardized coefficients).	Reading Gains on ITBS (2001-02 to 2002-03)				
	I	II	III	IV	V
Teachers' Qualifications					
ITAC	**0.14**	0.08	**0.12**	**0.13**	**0.13**
% teachers with ≤ 3 year exp.	-0.06	-0.06	-0.07	-0.07	-0.06
School Contextual Resources					
African American Moderate SES	**0.18**	**0.15**	**0.18**	**0.17**	**0.18**
Predominately Latino	**0.39**	**0.29**	**0.38**	**0.31**	**0.35**
Predominately Minority	**0.26**	**0.22**	**0.26**	**0.22**	**0.24**
Racially Diverse	**0.34**	**0.29**	**0.34**	**0.27**	**0.31**
Racially Integrated	**0.69**	**0.55**	**0.68**	**0.58**	**0.64**
% Limited English Proficient	**-0.19**	**-0.15**	**-0.19**	**-0.22**	**-0.20**
School Environment					
Distributed Leadership	**0.13**				
Parent-School Relations		**0.33**			
Teacher Professional Community			**0.16**		
Safety and Order				**0.25**	
Overall Climate					**0.12**
N	213	213	213	213	213
R-squared	0.46	0.52	0.47	0.47	0.47

- **School contextual resources have the largest impact on reading gains.**
- **ITAC and school environment measures have statistically significant independent effects.**
- **1 SD increase in ITAC = more than 1/10 SD in reading gain, or .2 gain in reading achievement. Average reading gain overall was .37.**

Note: School classification reference category is African American Low SES.

p≤0.01 **p≤0.05** **p≤0.10**

Predicting Student Mathematics Achievement at the Elementary/Middle School Level

	Mathematics Gains on ITBS (2001-02 to 2002-03)				
	I	II	III	IV	V
Teachers' Qualifications					
ITAC	0.08	0.02	0.06	0.06	0.06
% teachers with ≤ 3 year exp.	-0.06	-0.07	**-0.08**	**-0.09**	-0.07
School Contextual Resources					
African American Moderate SES	**0.20**	**0.16**	**0.19**	**0.18**	**0.19**
Predominately Latino	**0.41**	**0.31**	**0.40**	**0.27**	**0.35**
Predominately Minority	**0.27**	**0.23**	**0.27**	**0.21**	**0.23**
Racially Diverse	**0.31**	**0.27**	**0.31**	**0.19**	**0.25**
Racially Integrated	**0.73**	**0.58**	**0.72**	**0.55**	**0.64**
% Limited English Proficient	**-0.15**	-0.11	**-0.15**	**-0.20**	**-0.15**
School Environment					
Distributed Leadership	**0.20**				
Parent-School Relations		**0.40**			
Teacher Professional Community			**0.24**		
Safety and Order				**0.39**	
Overall Climate					**0.31**
N	213	213	213	213	213
R-squared	0.53	0.61	0.55	0.56	0.56

- **School context matters for math gains as well.**
- **School environment factors even stronger than for reading.**
- **ITAC is not significant for math.**
- **Croninger et al. (2007) found a similar result at the school level, and surmise difference of teacher effects by subject is due to emphasis on reading in elementary grades.**

Note: School classification reference category is African American Low SES.

p≤0.01 **p≤0.05** **p≤0.10**

Predicting Student Reading Achievement at the High School Level

	% Meets or Exceeds PSAE Reading (2001-02 to 2002-03)				
	I	II	III	IV	V
Teachers' Qualifications					
ITAC	0.07	0.06	0.03	0.003	0.06
% teachers with ≤ 3 year exp.	0.06	0.04	0.06	0.06	0.07
School Contextual Resources					
African American Moderate SES	0.05	0.05	0.05	0.06	0.06
Predominately Latino	0.06	0.05	0.07	0.07	0.06
Racially Diverse	0.06	0.07	0.07	0.09	0.09
Racially Integrated	0.17	0.16	0.18	0.16	**0.20**
% Limited English Proficient	-0.11	-0.11	-0.10	-0.10	-0.13
Average 8th Grade Achievement	**0.79**	**0.75**	**0.81**	**0.74**	**0.74**
School Environment					
Distributed Leadership	0.05				
Parent-School Relations		0.12			
Teacher Professional Community			0.08		
Safety and Order				**0.17**	
Overall Climate					0.09
N	34	34	34	34	34
R-squared	0.93	0.93	0.93	0.93	0.93

- **Value-added score not available.**
- **Prior 8th grade achievement accounts for nearly all of the variation in average reading achievement across schools.**
- **Safety and order has a marginally significant impact.**
- **ITAC is not significant.**

Note: School classification reference category is African American Low SES.

p≤0.01 p≤0.05 p≤0.10

Predicting Student Math Achievement at the High School School Level

	% Meets or Exceeds PSAE Mathematics (2001-02 to 2002-03)				
	I	II	III	IV	V
Teachers' Qualifications					
ITAC	0.12	0.09	0.03	0.01	0.09
% teachers with ≤ 3 year exp.	0.08	0.02	0.06	0.06	0.08
School Contextual Resources					
African American Moderate SES	0.04	0.04	0.05	0.05	0.06
Predominately Latino	0.08	0.08	0.11	0.13	0.09
Racially Diverse	0.15	0.16	0.16	0.19	0.20
Racially Integrated	**0.33**	**0.31**	**0.35**	**0.32**	**0.39**
% Limited English Proficient	-0.16	-0.16	-0.14	-0.14	-0.20
Average 8th Grade Achievement	**0.58**	**0.50**	**0.63**	**0.55**	**0.51**
School Environment					
Distributed Leadership	**0.16**				
Parent-School Relations		**0.27**			
Teacher Professional Community			**0.19**		
Safety and Order				**0.25**	
Overall Climate					**0.20**
N	34	34	34	34	34
R-squared	0.89	0.91	0.90	0.89	0.88

- **In addition to prior achievement, school environment factors are significantly related to high school math scores.**
- **ITAC is not significant. Monk and King (1994) found teacher preparation to be significant only at the classroom level in high schools.**

Note: School classification reference category is African American Low SES.

p≤0.01 p≤0.05 p≤0.10

Key Findings

- Collective qualifications of teachers in a school have an independent effect on reading gains at the elementary/middle school level.
- School environments have significant independent effects on
  - Elementary/middle school gains in reading and math (larger), and high school math scores.
  - Parent-school relations and safety and order tend to have the largest effects.
- We found no significant interactions between teacher qualifications and school environments in our achievement models.

Final Observations

- The quality of school environments, like the academic capital of teachers, is distributed unevenly across schools in Chicago such that schools that are advantaged in one arena tend to be advantaged in the other arena as well.
- As a result, some schools in Chicago, most notably those that are nearly 100 percent African American, are doubly disadvantaged.
- With only one year of data, we cannot determine if there is a causal relationship between ITAC and school environments. Further research using multiple years of data is needed so that we can better understand the dynamics of the relationship between these school-level factors.
- Of these school-level indicators, school environments have a more consistent impact on student achievement. Chicago might want to pay particular attention to improving student conduct and reaching out to parents, especially at the high school level.