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
  - teacher qualifications related to student performance at both the classroom level and the school level.
- School effects research
  - Strength of school environments linked student achievement differences.
- This study explores the link between the collective qualifications of teachers in a school and school environments.

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

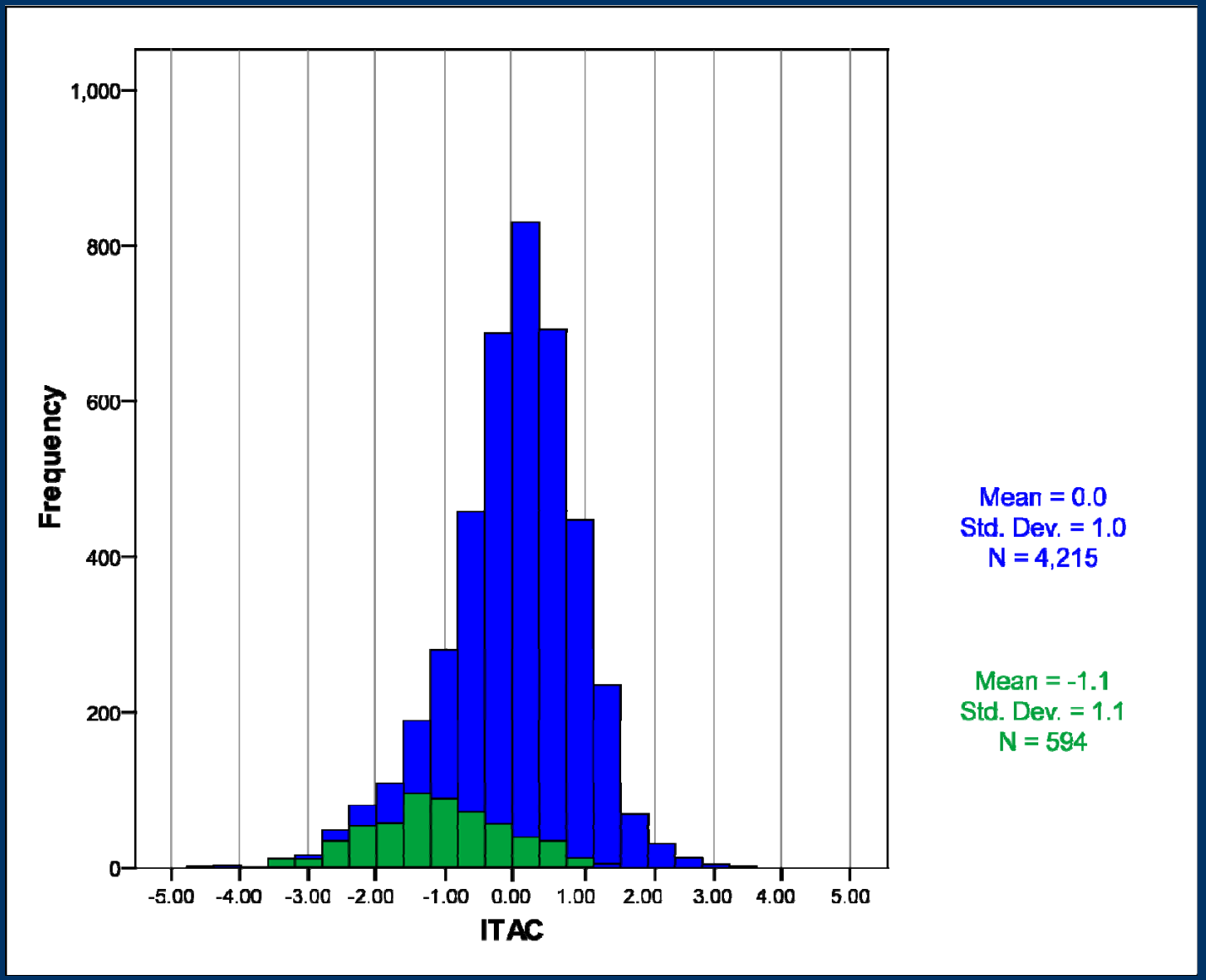
- The study uses 2002-2003 data on public elementary/middle and high schools in Chicago.
- Teacher Qualifications:
  - Created a school-level Index of Teacher Academic Capital (ITAC) to capture the average collective level of academic-oriented preparation of teachers in each school.
  - We used the State 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 4 school environment indicators + 1 composite indicator based on multiple measures of teacher and student responses provided by the Consortium on Chicago School Research's (CCSR) from their Spring 2003 surveys of Chicago public schools.

The Index of Teacher Academic Capital (ITAC)

- **ITAC statistically combines five school-level measures of teacher academic ability that research says are related to student achievement (Mean = 0.0, SD = 1.0):**

ITAC Components	Weight
Teachers' Mean ACT Composite Score	0.91
Teachers' Mean ACT English Score	0.90
% of Teachers Failing the Basic Skills Test on Their First Attempt	-0.36
% of Teachers with Emergency or Provisional Certification	-0.50
Teachers' Mean Undergraduate College Competitiveness Ranking	0.45

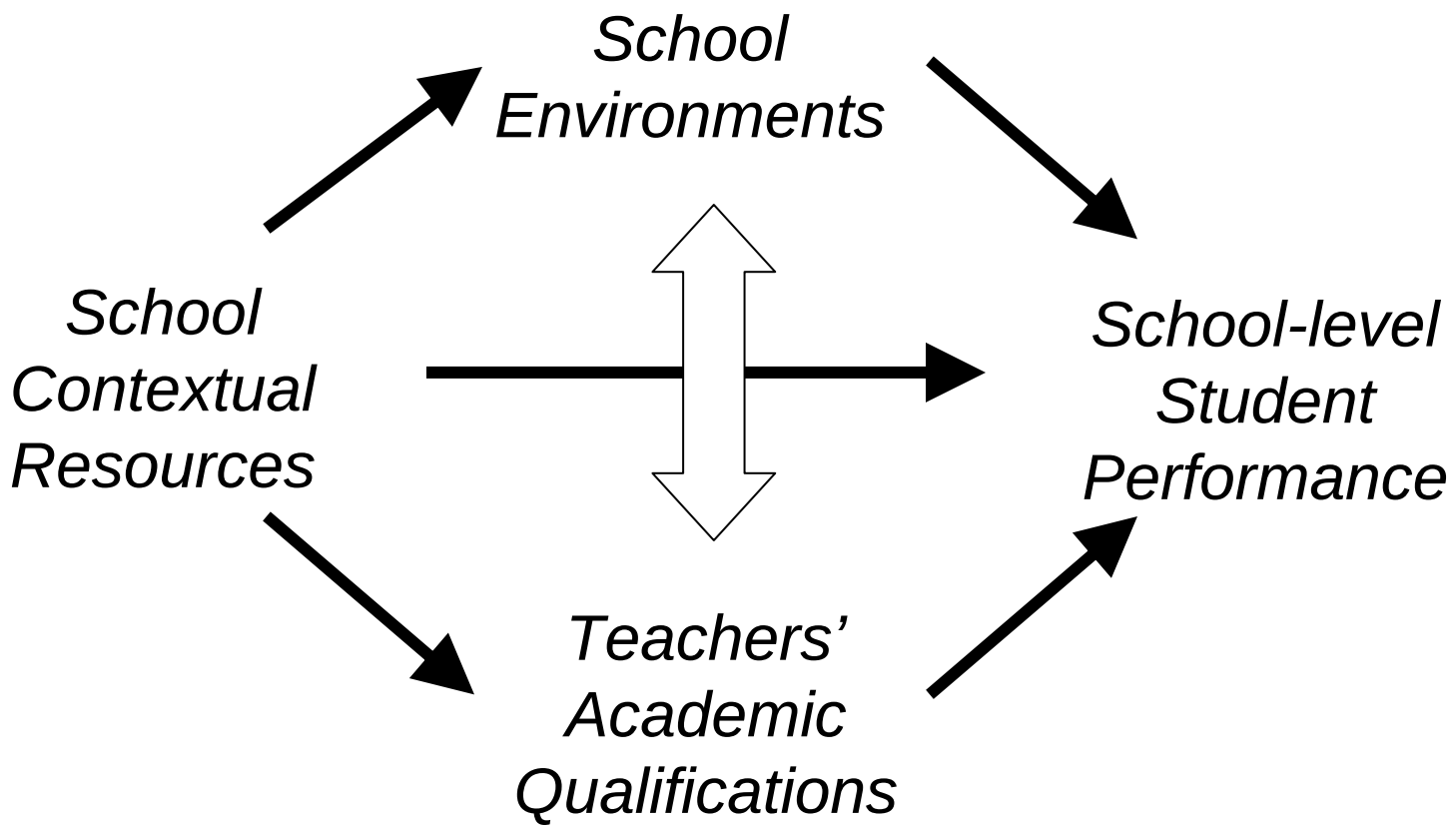
Distribution of ITAC for Illinois and CPS - 2003



Construction of School Environment Factors

School Environment Factor	Component 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
Overall Climate	• Combination of the other four factors

The Conceptual Framework



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

Correlations between ITAC and School Environment Factors in CPS

	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

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

- Schools with more academically-prepared teachers tend to have more positive school environments as well.
  - Correlations stronger at the high school level.
- Correlations with safety and order highest at both school levels.

Note: ITAC and School Environment factors distributed disproportionally among types of schools – 99%+ African American schools least likely to have high values, racially integrated schools most likely to have high values.

Predicting improvements in student achievement

Achievement outcomes

- For elementary/middle schools, we use average 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 use average school performance in reading and math in 2002-2003, but include a prior 8th-grade achievement score for entering freshmen.

We include two additional measures in our regressions

- % of teachers in each school with ≤ 3 years of teaching experience
- % of LEP students in each school

Results for Reading Gains at El/Middle Schools

(Numbers in cells are standardized coefficients. N=213).	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
R-squared	0.46	0.52	0.47	0.47	0.47

- **School contextual resources have the largest impact on reading gains.**
- **Both ITAC and school environment factors have statistically significant independent effects.**

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

p≤0.01 p≤0.05 p≤0.10

Results for Math Gains at El/Middle Schools

(Numbers in cells are standardized coefficients. N=213).	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
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 for math gains.**
- **ITAC is not significant for math gains, but inexperience matters marginally.**
- ***Croninger et al. (2007) found a similar result at the school level, and surmise teacher effects difference 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

Results for Reading at the High School Level

(Numbers in cells are standardized coefficients. N=34).	% Meets or Exceeds PSAE Reading (2001-02 to 2002-03)				
	I	II	III	IV	V
Teachers' Qualifications					
ITAC	0.07	0.06	0.03	0.03	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
R-squared	0.93	0.93	0.93	0.93	0.93

- Value-added score not available yet.
- Prior 8th grade achievement accounts for nearly all of the variation in average reading achievement across high schools.
- Safety and order has a marginally significant impact on reading over 8th grade achievement.
- School-level ITAC is not significant for reading scores over 8th grade scores at HS.

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

(Numbers in cells are standardized coefficients. N=34).	% 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
R-squared	0.89	0.91	0.90	0.89	0.88

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

- In addition to prior achievement, school environment factors are significantly related to higher math scores.
- ITAC is not statistically significant for math scores over 8th grade achievement at HS.

p≤0.01 p≤0.05 p≤0.10

Summary of Key Findings

- 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.
- Collective qualifications of teachers in a school have an independent effect on reading gains at the elementary/middle school level.
- The two school conditions appear to work independently. We found no significant interactions between teacher qualifications and school environments in our achievement models, even though they are highly correlated – i.e. usually found together in schools.

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 – and thus additionally hampered with regard to gains in performance.
- Given the impact of school environments Chicago might want to pay particular attention to improving student conduct and reaching out to parents, especially at the high school level where environmental conditions seem to be more negative.

Follow Up Research

- With only one year of data, we cannot determine if there is a causal relationship underlying the strong correlation 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.
- The notion of thresholds also may prove a useful avenue of investigation.
- If we are able to obtain value-added scores for high schools, it will be important to reassess our results at the high school level.

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