The Relationship between 2016-2017 District-wide Survey Responses and Student Achievement Data in Philadelphia

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Introduction

In spring 2014, the School District of Philadelphia (SDP) launched a new District-wide survey program for students, teachers, principals, and parents/guardians.[1] Staff from SDP's Office of Research and Evaluation (ORE) collaborated with the University of Pennsylvania's Graduate School of Education (UPenn GSE) to create Shared Solutions, a researcher-practitioner partnership whose first task was to develop and launch the District-wide surveys. The Shared Solutions team developed the surveys using the research of Bryk, Sebring, Allensworth, Easton & Luppescu (2010) on the five essential supports for school improvement. Survey questions are aligned to constructs that measure each of these five essentials: Climate, Instruction, Leadership, Professional Capacity, and Parent/Guardian Community ties (see Appendix A for descriptions of the five essentials). In line with the framework out of Chicago, the SDP district-wide surveys incorporate the five essential supports, with adaptations as appropriate to the particular context of Philadelphia.

This paper describes analyses conducted by ORE using data from surveys of students in District schools in grades 3-8 in the 2016-2017 school year and school-level standardized test scores to answer the following questions:

1. What is the relationship between survey responses and student achievement outcomes in SDP?
2. What role do school contextual factors play in the relationship between survey responses and student achievement outcomes?

Survey Framework and Development

In 2014, staff from ORE and UPenn GSE worked collaboratively with school stakeholders to develop Philadelphia's District-Wide Surveys. The surveys were developed based on Bryk and colleagues' (2010) research on the five essential supports for school improvement: school leadership, parent/guardian-community ties, professional capacity, school climate, and instruction. The survey team in Philadelphia looked to the work of Bryk et al. (2010) in Chicago for several reasons: the conceptual framework was grounded in a body of literature on effective schools, the conceptual framework was created in such a way that it could be used to shape future studies of school effectiveness, and the framework was empirically

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[1] For more information, please visit www.philasd.org/dws.

tested by using survey measures that supported the theory's validity (Wolford, Reitano, Hill, & Desimone, 2016). Specifically, Bryk and colleagues applied Rasch-scale analysis to surveys from the University of Chicago Consortium on School Research (CCSR) that were administered biannually in Chicago public schools to create measures that captured various aspects of the essential supports. The CCSR researchers then used factor analysis to combine these measures into factors that ultimately served as indicators for five organizational subsystems, referred to as the five essential supports for school improvement (Sebring, Allensworth, Bryk, Easton, & Luppescu, 2006). These measures of the essential supports were tested within the context of a longitudinal study of school improvement in several hundred elementary schools in Chicago that took advantage of the district's natural experiment in school decentralization prompted by the Chicago School Reform Act of 1988. In their work in Chicago, Bryk et al. (2010) considered whether the essential supports were present in schools, how they interacted with one another and school context, and the relationship between the strengths and weaknesses of the essential supports and improvement and stagnation in learning gains.

Based on their analyses, Bryk and his colleagues concluded that the five essential supports (school leadership, parent/guardian-community ties, professional capacity, school climate, and instruction) were positively related to school improvement, and additionally that each support contributed to improving student learning independently as well as through relationships with the other essential supports (Sebring et al., 2006). Specifically, "schools having strong indicator reports [high scores on the essential supports] were up to ten times more likely to improve students' reading and mathematics learning than were contexts where three or more of these indicators were weak" (Bryk et al., 2010, p. 198). Schools that were strong in all of the essential supports saw the greatest improvements in achievement, whereas schools that had a low score on one or more indicators had a less than ten percent probability of improving (Bryk et al., 2010).

SDP's surveys were created by combining SDP survey items with items from other surveys used nationally that had documented reliability and validity. After the initial draft surveys were created, SDP and Penn GSE researchers and practitioners reviewed them. The next phase of development involved collecting feedback on the draft surveys from Philadelphia stakeholders. These efforts

included focus groups and cognitive interviews[2] with students, teachers, school administrators, principals, parents and guardians, as well as staff from the SDP Office of Family and Community Engagement. Stakeholders who provided feedback were representative of a variety of schools, grades, subjects, and communities. Over the six-month period of survey development, each survey went through over 10 rounds of intensive review and revisions. Each fall since 2015, ORE staff re-examine the survey questions to ensure they are still relevant. While the core questions remain the same year to year, questions can be added or removed according to accommodate district- or city-wide priorities, new initiatives, or to avoid distributing an additional survey. Each year, the ORE survey team meets with multiple program offices (including the Family and Community Engagement office, the Office of Attendance and Truancy, the Office of Transportation, Office of Food Services, Office of Curriculum, Instruction, and Assessment, the Office of Student Supports, and the Office of Multicultural Curriculum Programs) to discuss high priority new questions and determine whether other questions can be removed.

Methods

This exploratory descriptive and correlational study examines the relationship between survey measures of school climate and instruction and standardized tests scores, and to what degree these relationships are mitigated or enhanced by other school-level characteristics. The survey measures used are those found on SDP's Philadelphia's District-wide surveys. There are four survey instruments: one for parents/guardians, one for students in grades 3-12, one for teachers, and one for school leaders. Across the instruments, there are five constructs: Climate, Instruction, Leadership, Professional Capacity, and Parent/Guardian Community ties. This paper focuses on the Climate and Instruction constructs as measured on the parent/guardian, student, and teacher surveys at schools serving students in grades 3-8 during the 2016-2017 school year.

These analyses extend the work of Bryk et al. (2010) by using survey responses that do not rely entirely on teacher perceptions gathered by teacher surveys. By including survey data that are representative of multiple voices, the study findings can serve to provide a more comprehensive understanding of the five essentials in schools.

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[2] During a cognitive interview, a respondent talks through each survey question, indicating any confusions or problems with the question.

Measures

District-wide surveys

In SDP, ORE administers the District-wide surveys to all District and Charter schools each spring. The surveys are administered online using SurveyMonkey, with a limited number of paper copies available for parents/guardians by request. Response rates over the past three years have increased overall, and in the most recent year for teachers and parents/guardians in particular (see Table 1).

Table 1: School District of Philadelphia District-wide Surveys Response Rates, 2014-2015 to 2016-2017*

	Student	**Parent/Guardian**	**Teacher**	**Principal**
2014-2015	33%	7%	53%	64%
2015-2016	50%	13%	51%	73%
2016-2017	49%	16%	56%	58%

 *See Appendix B for an explanation of how response rates are calculated.

The survey items across the four instruments align with one of the five essential supports identified by Bryk et al. (2010) as being key factors for school improvement, however some constructs are not represented on all surveys (see Table 2).

Table 2: Constructs and Survey Instrument Alignment

	Climate	**Instruction**	**Leadership**	**Professional Capacity**	**Parent/Guardian Community Ties**
Parent/Guardian	X	X			X
Student	X	X			
Teacher	X	X	X	X	X
Principal	X	X	X	X	X

Additionally, the constructs are comprised of sub-constructs. For example, on the teacher survey there is an "Innovation" sub-construct within the "Instruction" construct and an "Outreach/Communication" sub-construct within in the "Parent/Guardian Community Ties" construct. (See Appendix C).

After the first survey administration in 2014-2015, the internal consistency of the existing constructs and sub-constructs were validated though calculation of Cronbach's alphas for each of the five constructs (Cronbach, 1951). Additionally, Exploratory Factor Analysis (EFA) was used to further test construct validity (Child, 1990). Because changes were made to the surveys, particularly in the 2016-2017 school year, we re-examined the factors to confirm that the constructs and sub-constructs were still valid. (See Appendix C). Each year, construct-level scores

were calculated for each school that met the survey response threshold. For the analyses discussed in this paper, these scores were calculated using respondent level construct averages that are weighted by sub-construct and then averaged at the school-level. In other words, the average of all responses for a given sub-construct were calculated at the respondent level, and then averaged to create respondent level and school-level construct scores. All relevant items were reverse coded so that the highest value represented the most positive response. For these analyses, these were then averaged at the school-level.

State Standardized Test Scores

In SDP, students in grades 3-8 take the Pennsylvania System of School Assessment exams (PSSAs) in math and English language arts (ELA) every spring. For this study, the scaled scores from the math and from the ELA exams were averaged at the school-level.

School-level characteristics

The following school-level variables were included in as predictors in the analyses discussed below: Percent of students with an individualized education plan (IEP), percent of English language learner (ELL) students, percent of black/African American and Hispanic/Latino students, and the CEP Economically Disadvantaged rate.[3] Enrollment for each school is based on data taken from an October 31 snapshot.

Analyses

First, for each of the three surveys (teacher, student, and parent), correlation analyses were run between each of the sub-constructs, each construct, PSSA-Math, and PSSA-ELA scores to examine how strongly and in what direction survey data is related to academic achievement.

Next, OLS regression models were run with math PSSA-Math and PSSA-ELA scores as the dependent variables. Initial models examined the degree to which Climate and Instruction

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[3] Economic Disadvantage is reported as the Community Eligibility Provision (CEP) rate, which represents the percentage of students who are eligible for free meals and not subject to verification, multiplied by a USDA-defined factor of 1.6, and capped at 100%. Students who are eligible for free meals and not subject to verification include, but are not limited to, students directly certified through participation in the Supplemental Nutrition Assistance Program (SNAP), Temporary Assistance for Needy Families (TANF), and Food Distribution Program for Indian Reservations (FDPIR).

construct scores on the District-wide surveys are predictive of PSSA scores, when the following variables are accounted for: the percent of students with an IEP, percent of ELL students, percent of black/African American and Hispanic/Latino students, and CEP Economically Disadvantaged rate. Survey results were only included for schools if they met the response rate threshold.[4]

Findings

Consistent with results using 2015-2016 survey data, results from correlations using 2016-2017 parent/guardian, student, and teacher school-level survey data confirmed the theoretical framework of the surveys in that there were strong positive correlations between the Climate and Instruction construct and sub-construct scores and the school's average student score on both the math and ELA PSSAs (see Table 3). There were two acceptations for Instruction sub-constructs: Extracurricular activities, which is a sub-construct on the Parent/Guardian survey and Instructional Strategies, from the Teacher survey. Given these low correlations, the fact that the three Extracurricular items were new to the 2016-2017 survey, they were not included in the regression models discussed below.

In particular, student and teacher Climate scores were highly correlated with PSSA scores. When looking at the sub-construct level, the External Challenges sub-construct from the teacher survey stands out among the other sub-constructs with the highest correlation coefficients for ELA ($r = .809$, $p<.001$) and math ($r=.752$, $p<.001$). Questions that fall into this sub-construct ask teachers to rate the degree to which items are a challenge to student learning at their schools. Examples of items include: "Cultural differences between home and school;" "Frequent changes to District initiatives;" and "Neighborhood crime/safety."

All variables were centered and assumptions were checked, including collinearity, and no assumption violations were found. Initially, twelve models were run, as PSSA-Math and ELA scores were included separately as dependent variables.[5] The model that explained with most variance in PSSA-Math was that which included student Climate scores ($F(6, 137) = 93.16$, $p<.001$) with an R^2 of .810. This was the case for the ELA PSSA as well, where the regression equation including

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[4] Response rate thresholds: Student = 25% or a minimum of 25; Parent/guardian = 5% and a minimum of 25; teacher = 25% or a minimum of 25.
[5] Two subjects, two constructs, and three surveys.

students Climate scores resulted in a regression equation ($F(6, 137) = 93.82$, $p<.001$) with an R^2 of .811.

Table 3: Correlation results between survey Climate and Instruction construct scores and PSSA scores, 2016-2017

	PSSA-ELA	PSSA-Math
Student (N=138)		
Climate	**.721****	**.733****
Belonging	.618**	.678**
Bullying	.580**	.512**
Safety/Building Condition	.694**	.704**
Instruction		
Teaching and Learning	**.477****	**.564****
Parent/Guardian (N=101)		
Climate	**.508****	**.470****
Bullying	.378**	.362**
Safety/Building Condition	.511**	.467**
Instruction	.263**	.296**
Teaching and Learning	**.459****	**.484****
Extracurricular Activities	.077	.113
Teacher (N=169)		
Climate	**.699****	**.690****
Student-Centered Learning Climate	.381**	.410**
Respect	.435**	.432**
Classroom-Level Challenges	.661**	.657**
School-Level Challenges	.627**	.629**
External Challenges	.809**	.752**
Instruction	.380***	.475**
Student Engagement	**.690****	**.727****
Instructional Strategies	.001	.109

$*p<.05$, $**p<.01$, $***p<.001$

With the exception of the percent of ELL students and the percent IEP students, all independent variables were consistently significant predictors of PSSA scores. Specifically, the percent of ELL students was not a significant predictor of math or ELA scores in any model and percent of IEP students was not a statistically significant predictor of the PSSA-ELA or PSSA-math scores when the model included the Teaching & Learning score from the parent/guardian survey.

More specifically, when accounting for race/ethnicity, economic disadvantage, the percent of students with IEPs and the percentage who are ELLs, student Climate scores were significantly

predictive of ELA PSSA scores (β=.310, *p*<.001) and math PSSA scores (β=.333, *p*<.001). This held true for parent/guardian Climate and Teaching & Learning scores for ELA and math PSSA scores and for teacher Climate and Student Engagement scores (See Tables 4-6).

Table 4: Student (N=137 schools)

	PSSA-ELA			PSSA-Math		
Variable	B	S.E.	β	B	S.E.	β
% Black/Af. Am.	-61.01	11.55	-.389***	-79.98	12.30	-.479***
% Hispanic/Latino	-87.08	14.10	-.385***	-95.89	15.02	-.399***
% IEP	-155.66	37.51	-.166***	-165.28	39.97	-.166***
% ELL	-36.90	30.79	-.073	-9.13	32.80	-.017
CEP rate	-128.08	18.51	-.347***	-121.91	19.72	-.311***
Climate Construct Score	97.80	15.31	.333***	96.70	16.31	.310***
% Black/Af. Am.	-87.02	12.38	-.515***	-89.19	12.30	-.534***
% Hispanic/Latino	-105.78	15.29	-.468***	-105.17	15.18	-.438***
% IEP	-148.68	41.55	-.159***	-160.23	41.25	-.161***
% ELL	-29.08	34.10	-.057	-1.05	33.85	-.002
CEP rate	-157.22	19.87	-.426***	-150.67	19.73	-.384***
Instruction Construct Score	49.75	16.69	.147**	82.41	16.57	.230***

*p<.05, **p<.01, ***p<.001

Table 5: Teacher (N= 146 schools)

	PSSA-ELA			PSSA-Math		
Variable	B	S.E.	β	B	S.E.	β
% Black/Af. Am.	-66.77	11.17	-.413***	-88.11	11.83	-.522***
% Hispanic/Latino	-95.49	14.31	-.405***	-103.93	15.16	-.421***
% IEP	-149.95	22.21	-.258***	-129.61	24.58	-.214***
% ELL	-12.16	30.44	-.024	20.77	32.24	.039
CEP rate	-122.06	19.84	-.316***	-121.68	21.02	-.302***
Climate Score	57.29	8.66	.322***	51.72	9.18	.278***
% Black/Af .Am.	-69.53	10.96	-.430***	-86.41	10.98	-.512***
% Hispanic/Latino	-88.47	14.51	-.375***	-91.97	14.54	-.373***
% IEP	-125.31	23.46	-.216***	-120.07	23.51	-.168***
% ELL	-56.01	30.95	-.110	-26.82	31.01	-.050
CEP rate	-127.95	19.46	-.332***	-120.67	19.50	-.299***
Student Engagement Score	138.19	20.45	.332***	150.34	20.49	.346***

*p<.05, **p<.01, ***p<.001

Table 6: Parent/Guardian (N=101 schools)

Variable	PSSA-ELA			PSSA-Math		
	B	S.E.	β	B	S.E.	β
% Black/Af. Am.	-81.23	15.51	-.474***	-110.21	16.06	-.609***
% Hispanic/Latino	-97.74	19.02	-.413***	-108.33	19.70	-.434***
% IEP	-72.36	27.96	-.130*	-84.60	28.95	-.144**
% ELL	-34.45	39.47	-.066	-21.28	40.88	-.038
CEP rate	-152.05	23.83	-.435***	-143.70	24.68	-.390***
Climate Construct Score	90.08	22.92	.210***	73.34	23.74	.162**
% Black/Af. Am.	-82.74	15.33	-.483***	-108.45	15.46	-.601***
% Hispanic/Latino	-114.57	18.30	-.484***	-121.55	18.45	-.487***
% IEP	-39.37	28.19	-.071	-53.67	28.42	-.092
% ELL	-34.69	39.30	-.066	-20.22	39.62	-.037
CEP rate	-149.89	23.77	-.429***	-140.30	23.97	-.380***
Teaching and Learning Score	74.11	18.31	.215***	74.29	18.46	.204***

*p<.05, **p<.01, ***p<.001

Additional models that included both Climate and Instruction scores were run to investigate the degree to which each measure appeared to account for variation in PSSA test scores over and above the other. For students, the model fit increased only slightly when both Instruction and Climate were includes as predictors compared to when only Climate or Instruction is included. The regression models for math (F(7, 137) = 80.63, p<.001, R^2 = .813) and for ELA (F(7, 137) = 81.97, p<.001, R^2 = .815 were almost identical. Additionally, when both Climate and Instruction were included in the student models, Instruction was no longer a significant predictor. However, this is not surprising given the strong correlation between student Instruction and Climate scores (r=.79, p<.001). (See Appendix D).

The results of including both the Climate and Instruction (Student Engagement) scores in the teacher models were similar to those found in the student models. When PSSA-Math was the dependent variable, the model fit (R^2=.819) was better compared to Climate alone (R^2=.790) and slightly better to the R^2 of the model including just Student Engagement (R^2=.814). As with the student model, Student Engagement was no longer a significant predictor of PSSA-Math scores when Climate was included in the model. When PSSA-ELA was set as the dependent variable, the model fit increased with an R^2 of .812. However, unlike with math, both the Climate and Student Engagement scores remained significant predictors. (See Appendix D).

While the model fits for both ELA and math increased slightly when both Teaching and Learning and Climate scores from the parent/guardian survey are included, Climate scores no longer remained a significant predictor of PSSA scores. (See Appendix D).

Discussion and Next Steps

The strong relationship between the District-wide survey measures and student standardized test scores underscores Bryk et al.'s (2010) theoretical framework, which posits that surveys that measure organizational subsystems show a strong, positive relationships with student achievement, as measured by standardized test scores. This not only strengthens the validity of the framework in general, but also as it applies specifically to the Philadelphia context as measured by SDP's surveys. Additionally, these findings suggest that students in schools with lower test scores are not exposed to the same attitudes, perceptions, environments, and experiences as those in higher performing schools. As SDP continues to work toward its goal of ensuring that all children have access to a great school, close to where they live, the surveys, and the Climate and Instruction constructs in particular, can serve as useful tools for identifying areas of improvement and actionable next steps.

The data presented in this paper was from students in grades 3-8, as those students take the PSSAs. Older students, mostly in grades 9-11, take different state assessments (the Keystone exam). ORE plans to extend the analyses of the relationship between survey data for high school teachers, students, and their parents/guardians and school-level Keystone exams scores. Findings from initial correlational tests show significantly positive relationships between school-level student Climate scores and Keystone Literature exams ($r=.309$, $p<.05$), as well as between teacher Climate scores and Keystone Literature ($r=.590$, $p<.01$) and Keystone Algebra 1 scores ($r=.400$, $p<.01$). ORE also plans to extend the analyses to include the other survey constructs, particularly parent/guardian community ties. Additionally, given that SDP administers the District-wide survey annually, ORE plans to look at the relationship between survey data and PSSA scores longitudinally. Beginning with the first year of survey data (2014-2015), ORE will examine the degree to which the Climate and Instruction scores from the prior predict PSSA scores and if there are variations across respondent group and/or subject area. This will allow SDP to better replicate the work out of Chicago, which focused on improvement student achievement – or changes over time.

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Appendix A

1. **Climate** -- Areas affecting the school environment: school mission and vision, respectful relationships, student safety and support, and challenges to student learning.

2. **Instruction** -- Student engagement and how students, parents/guardians, and teachers feel about the quality of teaching and learning at their school.

3. **Leadership** -- How school leaders communicate and implement their school vision, how they manage their responsibilities, and how they perceive their level of autonomy.

4. **Professional Capacity** -- How school staff work together, what types of professional development teachers receive, and if teachers feel supported in growing and innovating in their classrooms.

5. **Parent/Guardian-Community Ties** -- How schools reach out to and communicate with parents/guardians, what parents/guardians think about these efforts, and how parents/guardians are getting involved with their child's education

Appendix B

SDP calculates response rates for each survey using the following rules:

Student - The percentage of students that responded to at least one question on the survey. This includes students in grades 3-12. The total number of potential respondents is based on student enrollment on May 31. Actual survey responses are associated with the school where the student was enrolled at the time the survey was completed.

Teacher - The percentage of teachers that responded to at least one question on the survey. The total number of potential respondents is based on active teachers on May 31. Actual survey responses are associated with the school where the teacher was active most recently at the time the survey was completed.

Parent/guardian - The percentage of parents/guardians that answered at least one question on the survey for a unique student. This assumes one parent/guardian respondent per student. The total number of potential respondents is based on the K-12 student enrollment on May 31. Actual survey responses are associated with the school where the student was enrolled at the time the survey was completed.

Appendix C

Table C1: Cronbach's alpha for district-wide survey Climate and Instruction constructs and sub-constructs, 2016-2017 Parent/Guardian Survey

Construct	Sub-construct	Number of Items	Cronbach's Alpha
Climate	Bullying	8	0.90
	Safety/Building condition	3	0.81
	Attendance	7	0.81
	Overall	18	0.67
Instruction	Evaluation of teaching & learning	6	0.87
	Evaluation of extracurricular	3	0.76
	Overall	9	0.86

Table C2: Cronbach's alpha for district-wide survey Climate and Instruction construct and sub-constructs, 2016-2017 Student Survey

Construct	Sub-construct	Number of Items	Cronbach's Alpha
Climate	Bullying	7	0.88
	Safety/Building condition	6	0.81
	Belonging	5	0.84
	Overall	18	0.86
Instruction	**Evaluation of teaching & learning**	15	0.92

Table C3: Cronbach's alpha for district-wide survey Climate and Instruction construct and sub-constructs, 2016-2017 Teacher Survey

Construct	Sub-construct	Number of Items	Cronbach's Alpha
Climate	Student-centered learning climate	13	0.83
	Respect	9	0.71
	Classroom challenges	6	0.75
	School-level challenges	18	0.92
	External challenges	5	0.84
	Attendance	4	0.83
	School discipline	7	0.89
	Overall	61	0.95
Instruction	Student engagement	17	0.74
	Instructional Strategies	15	0.87
	Overall	32	0.86

Appendix D

Table D1: Changes in regression coefficients for models with and without survey constructs, student survey 2016-2017

	R^2	R^2 with Climate	R^2 with Instruction	R^2 with Both
ELA	.752	.811	.768	.815
Math	.759	.810	.797	.813

Table D2: Changes in regression coefficients for models with and without survey constructs, teacher survey 2016-2017

	R^2	R^2 with Climate	R^2 with Instruction	R^2 with Both
ELA	.731	.796	.798	.812
Math	.742	.790	.760	.819

Table D3: Changes in regression coefficients for models with and without survey constructs, parent/guardian survey 2016-2017

	R^2	R^2 with Climate	R^2 with Instruction	R^2 with Both
ELA	.748	.784	.786	.793
Math	.771	.792	.805	.806