

Full Quantitative Analysis

Bridgeport Public School SEL Initiative Diving Deeper: Examination of school-level data on SEL implementation and student outcomes

SEL implementation varies across schools. In addition, there is variation across schools in the behavioral outcomes (chronic absenteeism and exclusionary discipline sanctions), academic outcomes (reading and math proficiency), school climate outcomes (student-teacher trust and emotional climate), and self-reported SEL skills (emotion self-regulation and behavior self-regulation) presented at the district level. For this reason, the case study team elected to use school-level values for these variables to examine the relationship among these factors.

Compiling school-level data. To conduct these analyses, the case study team compiled school-level data for all BPS elementary/middle schools. The team did not include BPS high schools in these analyses because, compared to elementary/middle schools, high schools:

- launched the district's SEL Initiative years later,
- have systematically higher rates of chronic absenteeism and exclusionary discipline sanctions,
- have substantially different ways of measuring ELA and math proficiency,
- did not administer the district's school climate and SEL survey for students during the 2016-17 and 2017-18 school years, and
- did not administer the district's SEL implementation survey for teachers/staff until the 2018-19 school year.

For the behavioral outcomes (chronic absenteeism and exclusionary discipline sanction rates), the case study team compiled data beginning with the 2012-2013 school year, which was the year before TFF began its investment in the district. For academic outcomes, school climate outcomes, and SEL outcomes, the team compiled data beginning with the 2014-2015 school year, which was the earliest year of data available. In addition, this was the year that school leaders from K-12 schools and SEL teams from BPS elementary/middle schools began to receive RULER training.

Because the case study team planned to analyze whether SEL implementation predicted these outcomes, the team chose to quantify SEL implementation at a single point in time. Given that implementation generally strengthens over the course of time, both within and across school years, the team chose to use data from the final spring administration of the SEL implementation survey before the onset of the COVID-19 pandemic.

Table 1: Variation across 29 BPS elementary/middle schools in school-level values for four indicators of SEL implementation, as of spring 2019

	Minimum school-level value	Maximum school-level value	Mean/average of school-level values	Standard deviation of school-level values
SEL indicator 1: Percentage of teachers at the school who reported that they had introduced two or more RULER anchor tools to students in their classroom	78.8	100.0	94.4	6.4
SEL indicator 2: Percentage of teachers at the school who reported that students had used the RULER Mood Meter in their classroom at least weekly in the past month	39.4	100.0	76.1	14.2
SEL indicator 3: Percentage of teachers at the school who said they were <i>somewhat, quite, or extremely comfortable</i> teaching SEL lessons to their students	48.5	100.0	82.0	14.6
SEL indicator 4: Percentage of respondents (teacher, staff, or school leader) at the school who said that RULER had been <i>somewhat, quite, or extremely helpful</i> in terms of teaching practical social and emotional skills	68.0	100.0	85.0	9.2

Analyzing effects. After compiling the school-level data for Bridgeport’s 29 elementary/middle schools, the team analyzed the relationship between each of the four SEL implementation indicators (predictors listed above in Table 1) and each of the eight outcomes (listed below in Table 2). After identifying the most appropriate mathematical equation for each of the 32 predictor-outcome pairs (4 SEL implementation indicators x 8 student outcomes), the team used the values produced by a regression analysis to determine whether the outcome changed statistically¹ over time, with the SEL implementation indicator, or both.

¹ In other words, the quantitative team determined whether there was a statistically significant association between each student outcome and time and whether there was a statistically significant association between each student outcome and each SEL implementation indicator. Because the term *statistically significant* is often equated erroneously with the word *significant* in the everyday sense of the word (*meaningful*), this case study describes changes in student outcomes as statistical changes, rather than statistically significant changes. More information on statistical significance is available in the Quantitative Analysis Technical Details appendix.

Table 2: Results of school-level analyses of the association between SEL implementation indicators, student outcomes, and time.

Outcome	Association with time	Association with SEL indicators
Chronic Absenteeism	Non-linear ²	None
Exclusionary discipline	Linear (Decreasing)	None
ELA proficiency	Non-linear ⁵	None
Math proficiency	Linear (Increasing)	None
Student-teacher trust	None	None
Emotional climate	None	None
Emotion self-regulation	None	None
Behavior self-regulation	Non-linear ⁵	None

To analyze the relationship between each of the four SEL implementation indicators and each of the eight student outcomes, the case study team conducted regression analysis within a multi-level modeling framework and examined fixed effects estimates for each of the predictor-outcome pairs. Regression analysis is a process for generating an equation that describes the mathematical relationship between a group of variables. The case study team used a multi-level modeling regression approach and expected outcomes to vary by school (for example, a school that sees improvement in one outcome area would be likely to see improvement in another area). Specifically, the team’s multi-level models treat outcomes as time (level 1) nested within schools (level 2).

Before running the regression analyses, the first step was to examine four covariance structure types and select the one that best fit the data for each outcome, based on Akaike Information Criterion (AIC) values. First order heterogeneous autoregressive (ARH1) structure appeared to fit best for chronic absenteeism and ELA proficiency; diagonal structure appeared to fit best for exclusionary discipline sanctions, math proficiency, student-teacher trust, emotional climate, emotion self-regulation, and behavior self-regulation.

The next step was to test two multi-level models for each of the 32 predictor-outcome pairs (4 SEL indicators x 8 outcomes): one that examined the outcome as a linear function of time and one that examined the outcome as a quadratic function of time. If the regression coefficient for the quadratic term was statistically significant, the team determined that the quadratic model fit better; if not, the team determined that the linear model was more appropriate. The quadratic model was a better fit than the linear model for three outcomes: chronic absenteeism, ELA proficiency, and behavioral self-regulation.

After selecting the better-fitting model, the team examined the regression coefficients to determine whether the outcome was associated with time and/or with the SEL implementation indicator. If a coefficient’s p-value was less than 0.05, the team stated that the variable was statistically associated with time. As noted above, stating that two variables are associated statistically does

² The quantitative analyses showed that this outcome changed statistically with time in a non-linear way. In other words, the outcome did not increase steadily over time or decrease steadily over time. For more information, please see the technical details section in the Appendix.

not provide information about the strength or size of the association, nor does it indicate a causal relationship between the two variables.

Results. Ultimately, the case study team determined that five of eight outcomes changed statistically over time. This change was linear for two outcomes: math proficiency rates increased steadily over time and exclusionary disciplinary sanction rates decreased steadily over time. Change was non-linear for three outcomes: chronic absenteeism, ELA proficiency, and behavior self-regulation. Although chronic absenteeism, ELA proficiency, and behavior self-regulation rates were predicted by time, the trend was not steady; rates decreased over early years and then increased over later years. Of these five outcomes, none were associated with any of the four SEL implementation indicators shown in Table 1.

Three of eight outcomes did not change statistically over time: student-teacher trust, emotional climate, and emotion self-regulation. This finding likely indicates that school-level values for these three outcomes are quite stable over time, similar to the stability shown on the bar graphs of district level values for these outcomes.

Discussion. There are several possible explanations for the finding that the four SEL implementation indicators do not predict any of the eight outcomes examined. Although contrary to established research, it is possible that these particular outcomes are not affected by the implementation of SEL programming. More likely, the lack of statistical associations is a result of limitations in the data. For example, it is possible that the four SEL implementation indicators do not capture SEL implementation with adequate accuracy and precision. For instance, the survey data may not fully represent the reality on the ground due to imperfections in survey items, bias in teacher responses, teacher participation patterns, etc. Third, the limited statistical power that results from a sample of only 29 schools means that the quantitative analyses can detect only large statistical effects. In other words, it is possible that effects are present, but they are too small for the team to detect because of the small sample size. Finally, using indicators of SEL implementation at a single point in time doesn't capture changes in SEL implementation over time, which may be relevant. For example, a school with a high level of SEL implementation in the spring of 2019 may have had a high level of implementation for several years, or its high level of implementation may be a recent development. Using values from one point in time does not account for differences in different schools' trajectories on their SEL journeys.