Making Connections

January 2017

How are middle school climate and academic performance related across schools and over time?

Adam Voight
Cleveland State University

Thomas Hanson
WestEd

Key findings

This study used grade 7 student data from approximately 1,000 middle schools in California for 2004/05–2010/11 to explore the relationship between school climate and academic performance across schools and over time. Key findings include:

- Schools with a more positive student-reported school climate had higher academic performance in English language arts and math.
- Changes in a school's student-reported school climate over time were associated with changes in academic performance at that school.
- The changes in academic performance within a school that are associated with changes in student-reported school climate over time were substantially smaller than the differences in academic performance across schools with different school climate values in a given year.

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Institute of Education Sciences
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REL WEST
Regional Educational Laboratory At WestEd

REL 2017–212

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January 2017

This report was prepared for the Institute of Education Sciences (IES) under Contract ED-IES-12-C-0002 by Regional Educational Laboratory (REL) West at WestEd. The content of the publication does not necessarily reflect the views or policies of IES or the U.S. Department of Education, nor does mention of trade names, commercial products, or organizations imply endorsement by the U.S. Government.

Voight, A., and Hanson, T. (2017). *How are middle school climate and academic performance related across schools and over time?* (REL 2017–212). Washington, DC: U.S. Department of Education, Institute of Education Sciences, National Center for Education Evaluation and Regional Assistance, Regional Educational Laboratory West. Retrieved from http://ies.ed.gov/ncee/edlabs.

This report is available on the Regional Educational Laboratory website at http://ies.ed.gov/ncee/edlabs.

Summary

A growing number of educators concur that, in order to improve student academic performance, schools need to focus not only on students' academic needs but also on their social, emotional, and material needs (Piscatelli & Lee, 2011). As a result, school climate—the social, emotional, and physical characteristics of a school community (Cohen, McCabe, Michelli, & Pickeral, 2009)—is gaining more attention as a lever to improve student academic performance.

Most studies on the relationship between school climate and academic performance assert that a more positive school climate promotes higher academic performance. But evidence of a relationship between the two is weak. These studies generally are based on data collected at a single point in time and compare academic performance across schools with different school climates. They show that academic performance is higher in schools with a more positive school climate at single points in time. However, little evidence exists that changes in school climate over time are associated with changes in academic performance.

This study used grade 7 student data from the California Healthy Kids Survey and administrative data for approximately 1,000 middle schools in California for 2004/05–2010/11 to measure students' perceptions about six domains of school climate. Schools with a positive school climate were those in which students reported high levels of safety/connectedness, caring relationships with adults, and meaningful student participation and low rates of substance use at school, bullying/discrimination, and student delinquency. School-level academic performance was measured using grade 7 California Standards Test scores in English language arts and math.

The study team examined the relationship between school climate and academic performance across schools to determine whether in a given year California middle schools with a more positive school climate had higher academic performance. The study team also sought to determine how academic performance for a given school improved as school climate improved by examining how changes in school climate over two-year intervals were related to changes in average academic performance.

Key findings include:

- Schools with a more positive student-reported school climate had higher academic performance in English language arts and math.
- Changes in a school's student-reported school climate over time were associated with changes in academic performance at that school.
- The changes in academic performance within a school that were associated with changes in student-reported school climate over time were substantially smaller than the differences in academic performance across schools with different school climate values in a given year. For example, in a given year schools at the 50th percentile on school climate were at the 48th percentile on math performance, on average, while schools at the 60th percentile on school climate were at the 51st percentile on math performance. This finding suggests that an improvement of 10 percentile points in school climate would be associated with an average 3 percentile point increase in academic performance. However, when followed over time, schools with a 10 percentile point increase in student perceptions of school climate averaged a less than 1 percentile point increase in academic performance.

This last finding is important because it suggests that the relationship between school climate and academic performance at a single point in time may not predict what will happen when school climate changes over time. Although the results suggest that school climate is associated with academic performance at a single point in time and that changes in school climate are associated with changes in academic performance across time, the results should not be used to infer that intentional efforts to improve school climate will also improve academic performance. The study was not designed to ascertain whether school climate is causally related to academic performance.

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Why this study?

A growing number of educators concur that, in order to improve student academic performance, schools need to focus not only on students' academic needs but also on their social, emotional, and material needs (Piscatelli & Lee, 2011). This shift in thinking is reflected in new models that some state and local education agencies have developed to define and measure school performance. In some states and districts standardized test scores and attendance records—which sometimes were the only targets and markers of school performance—are being combined with outcomes related to school climate—the social, emotional, and physical characteristics of a school community (Cohen, McCabe, Michelli, & Pickeral, 2009)—to create a more comprehensive framework for assessing improvement and accountability (see, for example, Taylor, 2013).

California has been a leader in this shift. The California Office to Reform Education (a consortium of 10 of the state's largest school districts) and the California Department of Education now include measures of school climate in their school accountability systems (California Office to Reform Education, 2013). As part of the California Department of Education's new funding stipulations (referred to as the Local Control Funding Formula), districts in the state are required to work with parents, students, staff, and community members to identify needs related to improving school climate, create an action plan to address the needs, and indicate how progress will be measured (Taylor, 2013).

School climate holds promise as a focus of intervention because it incorporates some root factors believed to undergird student academic performance

The Regional Educational Laboratory (REL) West School Climate Alliance[1] is a networked improvement community in which participating schools analyze their school safety and climate data to inform strategies for creating a more positive school climate. The alliance's members have been using the California Healthy Kids Survey, a school-climate survey administered to California students, to assess school climate needs and to monitor school climate improvements. Alliance members and other state and local education officials have expressed an interest in learning how school climate is related to academic performance. Examining this relationship can help administrators and educators better understand the extent to which school climate holds promise as a lever to improve student academic performance. In response, REL West examined the relationship between student-reported school climate and academic performance across schools in a given year and also explored how changes in school climate over time were associated with changes in academic performance.

School climate holds promise as a focus of intervention because it incorporates some root factors believed to undergird student academic performance (Bryk, Sebring, Allensworth, Luppescu, & Easton, 2010). Though schools and districts may not be able to intervene in some areas that affect student academic performance—such as families, neighborhoods, and economic policies—they can influence and improve school climate (Bradshaw, Koth, Thornton, & Leaf, 2009).

Most studies on the relationship between school climate and academic performance examine cross-sectional associations—that is, they use data for a single point in time. These studies compare academic performance across schools with different school climates and show that academic performance is higher in schools with higher scores on school-based measures of social support (Lee & Smith, 1999), quality of relationships (Niebuhr & Niebuhr, 1999), disciplinary climate (Ma & Klinger, 2000), racial climate (Mattison & Aber, 2007), and school cohesion (Stewart, 2008), as well as schools with higher scores on multiple domains of school climate (Bowen, Rose, & Ware, 2006; Brand, Felner, Shim,

Seitsinger, & Dumas, 2003) and on a global school climate index (Hopson & Lee, 2011; Uline & Tschannen-Moran, 2008).

There is little evidence on longitudinal associations—that is, how changes in an individual school's climate over time are associated with changes in that school's academic performance. That kind of information could be more relevant to school improvement planning than data on whether schools with a more positive school climate have higher academic performance than other schools do at a single point in time. Longitudinal association does not provide causal evidence but does offer information on how school climate and academic achievement develop in tandem. See box 1 for examples of cross-sectional and longitudinal associations.

Box 1. Illustrations of cross-sectional and longitudinal associations

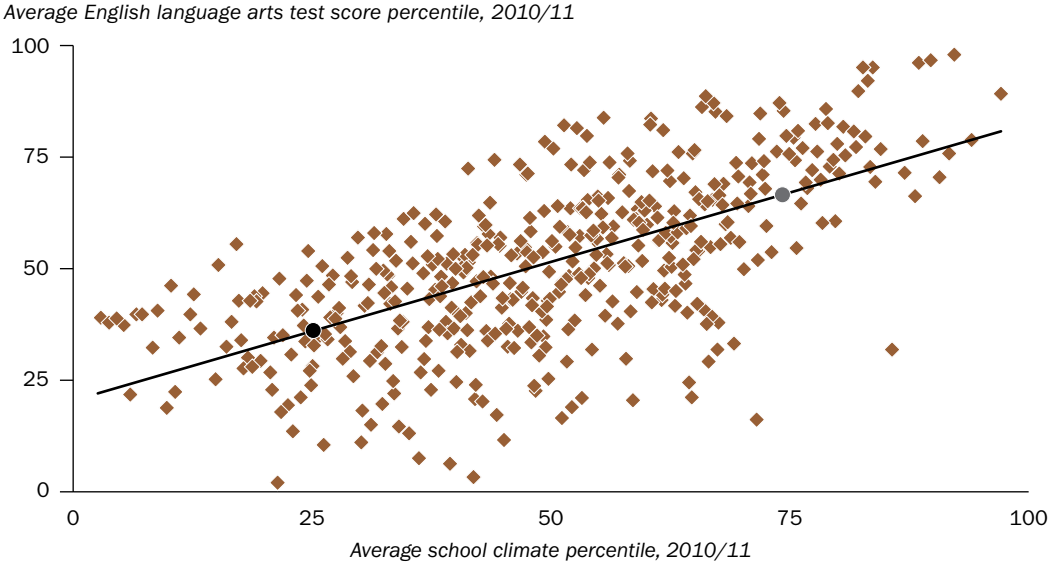
Evidence on longitudinal associations could be more relevant to school improvement planning than data on whether schools with a more positive school climate have higher academic performance than other schools do at a single point in time

Cross-sectional association

Cross-sectional comparison can provide information on how schools with a more positive school climate perform academically compared with schools with a less positive school climate; however, it does not indicate how changes in a particular school's climate may be related to changes in that school's academic performance.

The concept is illustrated in box figure A, in which each dot represents a school's average school climate percentile (horizontal axis) and its average English language arts test score percentile (vertical axis). The diagonal line represents the average English language arts test score percentile across all schools at each school climate percentile. The black circle represents the average English language arts test score percentile for schools with average school climate at the 25th percentile, and the gray circle represents the average English language arts test score percentile for schools with average school climate at the 75th percentile. Comparing English language arts test score percentiles for these two groups shows that the schools with a more positive school climate have higher average test scores than do schools with a less positive school climate.

Figure A. Cross-sectional (across-school) association between school climate and academic performance



Source: Authors' analysis based on 2010/11 data from the California Healthy Kids Survey and the California Department of Education's Standardized Testing and Reporting program.

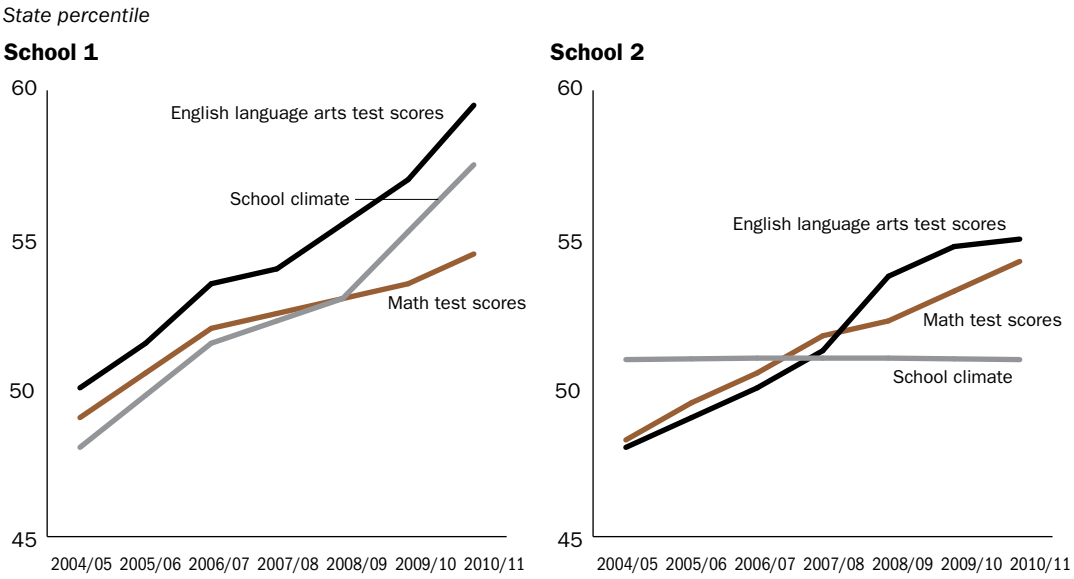
(continued)

Box 1. Illustrations of cross-sectional and longitudinal associations *(continued)*

Longitudinal association

Longitudinal association can vary greatly from school to school, as illustrated in box figure B. School 1 experienced improvements in school climate as well as in English language arts and math test scores from 2004/05 to 2010/11. There appears to be a longitudinal association between school climate and test scores in school 1: improvements in school climate were accompanied by improvements in academic performance. In contrast, there does not appear to be a longitudinal association between school climate and academic performance in school 2: school 2 had a stable school climate but increases in test scores.

Figure B. Year-to-year changes in school climate and academic performance in two hypothetical California middle schools



Source: Authors' construction based on simulated data.

Impact studies of school climate interventions provide further evidence of a relationship between school climate and academic performance. Commonly employed strategies for school climate improvement include schoolwide prevention approaches and student social and emotional learning approaches (Osher, Bear, Sprague, & Doyle, 2010). Schoolwide prevention approaches involve all school staff in installing a behavior management system that incentivizes prosocial student conduct, institutionalizes consistent and proactive classroom management strategies, and emphasizes staff professional development (Center on Positive Behavioral Intervention and Supports, 2004). Student social and emotional learning approaches make student development central, using classroom social-skill instruction along with activities that give students opportunities to apply the skills they have learned (Collaborative for Academic, Social, and Emotional Learning, 2003). Schoolwide prevention and student social and emotional learning are broad strategies for improving school climate in which specific programs and practices operate. A summary of student social and emotional learning program impacts found that such programs and practices have similar beneficial impacts on social behavior and academic performance, suggesting that both outcomes are linked (Durlak, Weissberg, Dymnicki, Taylor, & Schellinger, 2011). Schoolwide

positive behavioral supports have been found to increase perceptions of the safety and quality of the school environment in elementary schools but not to improve academic performance (Bradshaw, Mitchell, & Leaf, 2010; Horner et al., 2009).

What the study examined

Two research questions guided the study:

1. In an average year what is the relationship between student-reported school climate and students' average academic performance across schools?

2. For a given school how does students' average academic performance change as student-reported school climate changes?

The study team used grade 7 student data for approximately 1,000 middle schools in California for 2004/05–2010/11 obtained from the California Healthy Kids Survey, the California Standardized Testing and Reporting program, and the California Basic Educational Data System.

The California Healthy Kids Survey was the source of student-reported school climate data. Survey measures of student perceptions about six domains of school climate were used in the study: safety and connectedness, caring relationships with adults, meaningful student participation, substance use at school, bullying/discrimination, and student delinquency (Hanson & Voight, 2014). These domains may be particularly important for middle school students, who display an increasing desire for autonomy and social acceptance (Eccles et al., 1993). Schools with a positive school climate were those in which students reported high levels of safety and connectedness, caring relationships with adults, and meaningful student participation and low rates of substance use at school, bullying/discrimination, and student delinquency (see appendix A). The two research questions were examined using measures of the six school climate domains and a global measure of school climate. The relationships of specific school climate domains to academic performance were examined to see whether specific aspects of school climate are more strongly associated with academic performance than are other aspects of school climate.

Schools with a positive school climate were those in which students reported high levels of safety and connectedness, caring relationships with adults, and meaningful student participation and low rates of substance use at school, bullying/discrimination, and student delinquency

Academic performance was measured using grade 7 California Standards Test scores in English language arts and math. The California Standards Test, which has since been replaced by the Smarter Balanced Assessment, was criterion referenced to state-adopted academic content standards. Academic performance data are available annually, and most schools administer the California Healthy Kids Survey biennially; so the longitudinal relationship between school climate and academic performance was examined over two-year intervals. See appendix B for more details on the data and methodology.

To make the results easier to interpret, school climate and academic performance were converted into state percentiles on the basis of their distribution across middle schools in the state. Percentiles range from 1 to 99, and each value represents the percentage of schools that have the same or a lower score. For example, a percentile of 25 means that 25 percent of middle schools in the state had the same score as or a lower score than the referent score. The associations reflect how much a 1 percentile point change in school climate is associated with a given percentile point change in academic performance.

Results using both a standard deviation metric, which shows how much a 1 standard deviation change in school climate is associated with a given standard deviation change in academic performance, and a percentile point difference are shown in appendix C so that comparisons can be made between the two approaches.

School climate and academic performance vary both across schools at a single point in time and within schools over time. (Perceptions of school climate and academic performance also vary across students within the same school, but this study does not examine this type of within-school variation.) At any point in time schools have substantial differences in school climate and academic performance. By analyzing the longitudinal association between school climate and academic performance, this study finds more rigorous evidence on the relationship between school climate and academic performance than previous research has produced. Although this study provides no causal evidence, describing how changes in school climate (and its component domains) correlate with changes in student achievement can help educators develop expectations for how achievement and climate move in tandem. For example, a finding that changes in school safety and connectedness are more strongly associated with changes in student performance than are changes in other domains of school climate may encourage schools to emphasize that domain in measurement systems or interventions.

What the study found

This section presents the findings on the relationship between school climate and academic performance across schools with different school climates at the same point in time as well as findings on the association between improvements in school climate and improvements in academic performance within individual schools over time.

Schools with more positive student-reported school climate had higher average academic performance

A school with a student-reported school climate that was 10 percentile points higher than that of another school had an average test score that was 2.5 percentile points higher in English language arts and 3.4 percentile points higher in math, after demographic and socioeconomic characteristics of enrolled students were accounted for (table 1). The results are based on the average test score and school climate percentile for each school across 2004/05–2010/11.

Each school climate domain had a statistically significant relationship with English language arts and math test scores. Relationships with test scores were stronger for safety and connectedness (2.5 percentile points for English language arts and 3.5 percentile points for math), substance use at school (–2.6 and –3.5), and student delinquency (–2.6 and –3.4) than for caring relationships with adults (1.6 and 2.3), meaningful student participation (1.5 and 2.3), or bullying and discrimination (–1.3 and –2.1; see table 1).

School-level changes in student-reported school climate over time were often related to simultaneous changes in academic performance over time

A 10 percentile point increase in student-reported school climate was associated with a 0.5 percentile point increase in the average English language arts test score and a 0.7 percentile point increase in the average math test score over a two-year period (table 2). A 10 percentile point increase in safety and connectedness was associated with a

Table 1. Cross-sectional association between school climate and academic performance in California middle schools, by subject, 2004/05–2010/11 (percentile points)

Measure	Difference in average English language arts test score	Difference in average math test score
School climate[a]	2.5*	3.4*
School climate domains		
Safety and connectedness	2.5*	3.5*
Caring relationships with adults	1.6*	2.3*
Meaningful student participation	1.5*	2.3*
Substance use at school	–2.6*	–3.5*
Bullying and discrimination	–1.3*	–2.1*
Student delinquency	–2.6*	–3.4*

* Statistically different from zero at the .05 level using a two-tailed test.

Note: Values are percentile point differences in academic performance between a school with an average student-reported school climate value that is 10 percentile point higher than that of another school. Values are derived from 14 between-school regression models that were estimated separately for each school climate measure and each academic performance outcome. The models also included controls for percentages of students who are Black, Hispanic, eligible for the federal school lunch program, and English learner students. The analytic sample consisted of 978 schools and 3,069 observation points, one for each year/school combination that could be included in the analyses (see appendix B). The variables are school averages across all available years of data.

a. To calculate the value for overall school climate, the study team reverse-coded the survey results for substance use at school, bullying and discrimination, and student delinquency so that high scores on these domains refer to more positive school climates.

Source: Authors' analysis based on 2004/05–2010/11 data from the California Healthy Kids Survey and the California Department of Education's Standardized Testing and Reporting program.

Table 2. Longitudinal association between school climate and academic performance in California middle schools, by subject, 2006/07–2010/11 (percentile points)

Measure	Change in average English language arts test score	Change in average math test score
Global school climate[a]	0.5*	0.7*
School climate domains		
Safety and connectedness	0.5*	0.9*
Caring relationships with adults	0.4*	0.7*
Meaningful student participation	0.2*	0.2
Substance use at school	–0.5*	–0.6*
Bullying and discrimination	–0.1	–0.4*
Student delinquency	–0.5*	–0.7*

* Statistically different from zero at the .05 level using a two-tailed test.

Note: Values are percentile point differences over a two-year period in academic performance at a school in which there is a 10 percentile point increase in the average student-reported school climate value. Values are from fixed-effects regression models that included fixed-effects (dummy variables) for each school and controls for percentages of students who are Black, Hispanic, eligible for the federal school lunch program, and English learner students. The models also controlled for average test scores, measured two years prior to the test score outcome. The analytic sample consisted of 973 schools and 2,131 observation points, one for each year/school combination that could be included in the analyses. Five schools and 12 observation points were excluded from the analysis because of missing test score data measured in the same year as school climate or measured two years prior to the test score outcome.

a. To calculate the global school climate value, the study team reverse-coded the survey results for substance use at school, bullying and discrimination, and student delinquency so that high scores on these domains refer to more positive school climates.

Source: Authors' analysis based on 2006/07–2010/11 data from the California Healthy Kids Survey and 2004/05–2010/11 data from the California Department of Education's Standardized Testing and Reporting program.

0.5 percentile point increase in the average English language arts test score, and a 10 percentile point increase in caring relationships with adults was associated with a 0.4 percentile point increase in the average English language arts test score. A 10 percentile point increase in substance use at school and in student delinquency were both associated with a 0.5 percentile point decrease in the average English language arts test score. The increase in the average math test score associated with a 10 percentile point increase in each school climate domain except for meaningful student participation ranged from –0.4 percentile point (for bullying and discrimination) to 0.9 percentage point (for safety and connectedness; see table 2).

The within-school longitudinal associations of school climate and academic performance over time were smaller than the between-school cross-sectional associations at a single point in time

The average within-school longitudinal association between student-reported school climate and academic performance was smaller than the between-school cross-sectional association

In a comparison across schools at a single point in time a school with a student-reported school climate that was 10 percentile points higher than that of another school had test scores that were 2.4 percentile points higher in English language arts and 3.4 percentile points higher in math (see table 1). In a comparison of the same school over a two-year period a 10 percentile point increase in student-reported school climate level was associated with a simultaneous 0.5 percentile point increase in the average English language arts test score and a 0.7 percentile point increase in the average math test score (see table 2). Thus the average within-school longitudinal association between student-reported school climate and academic performance was smaller than the between-school cross-sectional association.

Implications of the study findings

Some state and local education agencies are committing substantial resources to measuring and improving school climate, often guided by the notion that school climate is predictive of academic performance. This study shows how the two factors are related in California middle schools by examining both the cross-sectional and longitudinal associations between school climate and academic performance.

The study results demonstrate that schools with more positive school climates—schools with higher student-reported levels of safety/connectedness, caring relationships with adults, and meaningful student participation and lower student-reported rates of substance use at school, bullying/discrimination, and student delinquency—had higher test scores than did schools with less positive school climates.

Within an individual school increases in positive student-reported school climate values tended to accompany increases in academic performance (and vice versa). But this longitudinal association between school climate and academic performance was small: a 10 percentile point increase in school climate values was associated with a 0.5–0.7 percentile point increase in academic performance, compared with a 2.4–3.4 percentile point difference in academic performance between schools with a 10 percentile point difference in school climate at a single point in time.

Thus, although schools with positive school climate values had substantially higher academic performance than did schools with lower school climate values, the differences across schools were not an accurate guide for predicting the magnitude of school-specific

increases in academic performance associated with increases in school climate values. One reason that the cross-sectional association between school climate and academic performance was stronger than the longitudinal association may be that there is more longitudinal variation in school climate than in academic performance across the seven years of data analyzed.

Another reason why the longitudinal association might be weaker than the cross-sectional association could be that school climate is affected by random temporal factors, whereas differences across schools in school climate reflect true difference in school climate. Thus, the longitudinal association may understate the impact of changing school climate on academic performance.

Limitations of the study

Although schools with positive school climate values had substantially higher academic performance than did schools with lower school climate values, the differences across schools were not an accurate guide for predicting the magnitude of school-specific increases in academic performance associated with increases in school climate values

This study has several limitations.

First, a critical limitation of the study is that it is based on nonexperimental data. While the results suggest that changes in school climate are associated with changes in academic performance within schools, causal interpretations of the relationship between the two factors should not be drawn. Thus, the results should not be used to infer that intentional efforts that improve school climate will also improve academic performance. Nor should they be used to rule out a positive impact of efforts to improve school climate on academic performance. Experimental methods are much better suited to make those sort of causal inferences. Although school climate may be difficult to manipulate, experimental studies of school climate–focused interventions would be better suited for investigating causal impacts of intentional efforts to improve school climate on academic performance.

Second, the results cannot rule out the possibility that school-level increases in academic performance drive improvement in school climate. It may be that as test scores rise, students feel increasingly more positive about their school.

Third, while the climate measures used in the study have been extensively validated and used in numerous studies (see Hanson & Voight, 2014), they may not be sufficiently accurate or may not capture aspects of school climate that are more closely associated with academic performance. As noted above, the longitudinal relationship between school climate and academic performance might be weaker than the cross-sectional relationship simply because changes over time in observed school climate may be more affected by random noise than differences across schools in observed school climate.

Fourth, although academic performance data are available for every year for all the schools in the sample, few schools administer the California Healthy Kids Survey every year, and most schools in the sample administered it every other year. One drawback of the missing-data structure (that is, data that are generally collected only every other year) for school climate is the inability to examine more short-interval changes in school climate and how the changes are associated with subsequent short-interval changes in academic performance.

Fifth, the California Healthy Kids Survey is anonymous, so individual student responses cannot be linked to students' standardized test score data. Partly for this reason, the

analyses were conducted at the school level. One drawback of this approach is that the composition of students whose survey responses and standardized test scores are used to calculate school-level variables differs from year to year, so a new group of grade 7 students constitutes the sample each year. This results in the inability to directly model prior academic performance and school climate perceptions. In addition, only grade 7 students are included in the analyses, which may limit the generalizability of findings across all middle school grades.

A final limitation is the manner in which school climate and the various domain scores were created for the study. A school's climate is based on the average perception of all students in the school who completed the California Healthy Kids Survey in a given year. Schools with fewer than 20 student respondents (approximately 1 percent of the sample) were eliminated from the study, but questions remain about how accurately the perceptions of survey respondents reflect the perceptions of all students in the school.[2]

Appendix A. School climate domains measured on the California Healthy Kids Survey, grade 7 students

The school climate domains measured by each of 39 survey questions found in the California Healthy Kids Survey are shown in figure A1. As described in appendix B, confirmatory factor analysis was used to ascertain the dimensions measured by the items and to estimate factor scores for analyses. Because all the items have Likert-type response options, they were treated as ordinal in the analyses using Muthén's (1984) approach to confirmatory factors analysis with original indicators. Students' latent factor scores on each of the estimated factors were aggregated to the school level to create school averages.

Safety and connectedness

Response options for five of the six items used to assess safety and connectedness ranged from 1 (strongly disagree) to 5 (strongly agree), with the neutral category (neither disagree nor agree) at the midpoint. The sixth item, "How safe do you feel when you are at school," has response options ranging from 1 (very safe) to 5 (very unsafe).

Caring relationships with adults

Six items with matching response options were used to assess caring relationships with adults. The items asked students to rate statements about caring relationships with adults ("At school, there is an adult who really cares about me") and supportive, high-expectations messages from adults at school ("At school, there is an adult who tells me when I do a good job"). Response options range from 1 (not at all true) to 4 (very much true).

Meaningful participation

Three items were used to assess meaningful participation at school ("At school, I do things that make a difference"). Response options range from 1 (not at all true) to 4 (very much true).

Substance use at school

Four items were used to assess substance use at school ("During the past 30 days, on how many days on school property did you…smoke cigarettes, have a least one drink of alcohol, smoke marijuana, use any other drug, pill, or medicine to get 'high' or for other than medical reasons?"). Response options included 1 (0 days), 2 (1 day), 3 (2 days), 4 (3–9 days), 5 (10–19 days) and 6 (20–30 days). Each of these items was recoded into a two-category measure (0 days versus 1 or more days) and treated as dichotomous in the factor analyses.

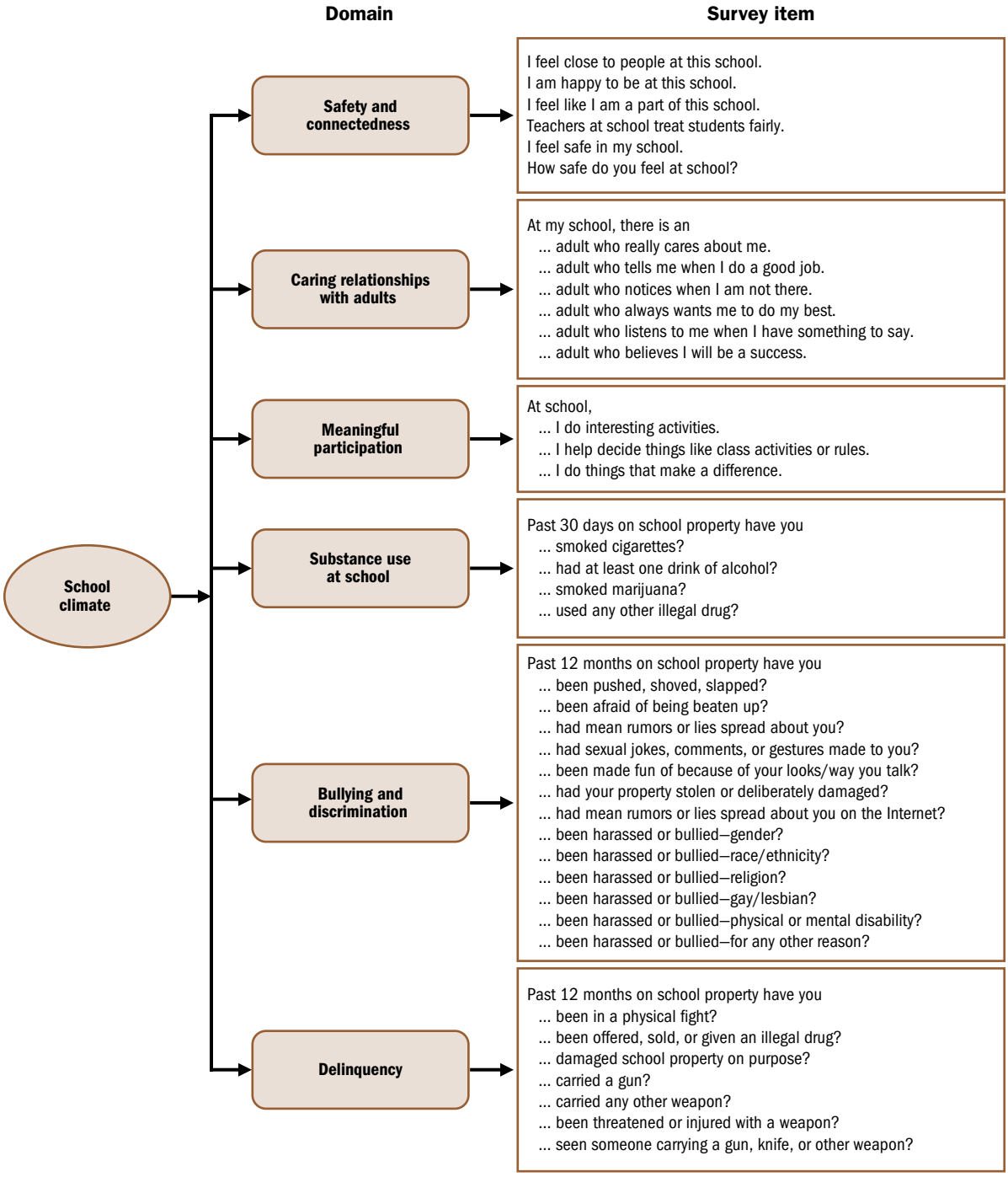
Bullying and discrimination

Thirteen items asking about victimization and harassment were used to assess bullying and discrimination ("During the past 12 months, how many times on school property have you…been pushed, shoved, slapped, hit, or kicked by someone who wasn't just kidding around?"). Response options ranged from 1 (0 times) to 4 (4 or more times).

Delinquency

Seven items were used to measure student delinquency ("During the past 12 months, how many times on school property have you damaged school property on purpose?"). Response options ranged from 1 (0 times) to 4 (4 or more times).

Figure A1. School climate domains and survey items measured on the California Healthy Kids Survey, grade 7 students



Source: Hanson & Voight, 2014.

Appendix B. Data and methodology

This appendix describes the data and methodology used to answer the study's research questions.

Data

This descriptive study used three secondary statewide data sources.

School climate data. This study drew on existing data from California public schools' administration of the California Healthy Kids Survey, a student self-report survey included in the California School Climate, Health, and Learning Survey System. The survey includes 39 items that measure students' perceptions about their exposure to risk and protective factors in their school environments (see appendix A for a list of the 39 items). Since 1997, WestEd's Health & Human Development Program has worked with the California Department of Education to administer the survey to students in grades 7, 9, and 11 in schools statewide and to analyze and report results.

The California Department of Education granted the study team permission to use a sample of California Healthy Kids Survey data. The analytic student sample consisted of data from grade 7 students in 978 California middle schools from 2004/05 to 2010/11. (Statewide, the number of middle schools increased from 1,254 in 2004/05 to 1,305 in 2010/11.) Because the model results are based on nonexperimental data, they should not be used to make inferences about the potential benefits to academic performance associated with intentional efforts to improve school climate. The number of schools that administered the survey in each study year is shown in table B1. On average, 66.6 percent of enrolled grade 7 students participated in the survey from 2004/05 to 2010/11.

Schools typically administer the California Healthy Kids Survey once every two years, the minimum interval needed to receive Safe and Drug-Free Schools and Communities (Title IV) funding and state Tobacco Use Prevention Education program funding; as a result, few schools in the sample collected survey data in each of the study years. Of the

Table B1. Number of schools and percentage of California grade 7 students represented in the California Healthy Kids Survey data, by year

Year	Number of schools	Average school response (percent of grade 7 students)
2004/05	327	60.5
2005/06	593	64.4
2006/07	301	63.2
2007/08	673	67.5
2008/09	285	69.7
2009/10	671	69.2
2010/11	229	71.6
Total[a]	978	66.6

Note: Schools that administered the survey only once from 2004/05 to 2010/11 were excluded from the sample.

a. Number of unique schools that administered the survey on two or more occasions at any time from 2004/05 to 2010/11.

Source: Authors' analysis based on 2004/05–2010/11 data from the California Healthy Kids Survey.

978 middle schools that administered the survey on two or more occasions anytime from 2004/05 to 2010/11, only 2 administered it in all seven study years, and 817 middle schools (83 percent) administered it on three or more occasions.

The analytic sample for the cross-sectional analyses consisted of 978 schools and 3,069 observation points, one for each year/school combination that could be included in the analysis. The analytic sample for the longitudinal analyses consisted of 973 schools and 2,131 observation points. Five schools and 12 observation points were excluded from the logitudinal analysis because of missing test score data measured in the same year as school climate or measured two years prior to the test score outcome.

In terms of student race/ethnicity, the California Healthy Kids Survey grade 7 sample is representative of grade 7 students statewide (table B2). For example, in 2010/11 there were 468,025 grade 7 students in California public schools (Education Data Partnership, 2015), and 54,272 participated in the survey that school year. Of the grade 7 students with a single reported race/ethnicity statewide, 52 percent were Hispanic, 28 percent were White, 12 percent were Asian or Pacific Islander, 7 percent were Black, and 1 percent were American Indian (California Department of Education, 2013). That same year, 52 percent of grade 7 respondents to the survey were Hispanic, 26 percent were White, 13 percent were Asian or Pacific Islander, 5 percent were Black, and 4 percent were American Indian.

School academic performance. To examine the relationship between school climate and academic performance, the study team drew on school performance data from the California Department of Education's Standardized Testing and Reporting program. School-level academic performance was measured using grade 7 California Standards Test scores in English language arts and math from 2004/05 to 2010/11. The California Standards Test is criterion referenced to state-adopted academic content standards. For this study, a school's academic performance was based on continuous scale score data on student standardized

Table B2. Racial/ethnic composition of grade 7 students statewide and represented in the California Healthy Kids Survey data, by study year

	Total number of grade 7 students		Percent of Black students		Percent of American Indian students		Percent of Asian or Pacific Islander students[a]		Percent of Hispanic students		Percent of White students	
Year	State	CHKS	State	CHKS	State	CHKS	State	CHKS	State	CHKS	State	CHKS
2004/05	492,917	73,160	8	5	1	2	11	11	47	53	32	29
2005/06	491,516	142,059	8	6	1	2	12	18	48	44	31	31
2006/07	492,883	67,404	8	5	1	2	11	13	50	54	30	28
2007/08	487,331	164,447	8	6	1	2	12	17	50	50	29	26
2008/09	479,359	63,020	8	4	1	2	12	13	51	54	29	27
2009/10	466,926	165,798	7	6	1	2	12	17	52	52	28	24
2010/11	468,025	54,272	7	5	1	4	12	13	52	52	28	26

Note: "State" refers to statewide grade 7 student demographic data from the California Department of Education (2013). "CHKS" refers to self-reported survey data from grade 7 students on the California Healthy Kids Survey. Because of asymmetrical classifications between statewide and survey demographic data, the denominator for percentages excludes students who were of multiple races/ethnicities, students who indicated other race/ethnicity on the survey, and students who had missing race/ethnicity data. Percentages may not sum to 100 because of rounding.

a. Includes students classified as Filipino in statewide data.

Source: Authors' analysis based on 2004/05–2010/11 data from the California Healthy Kids Survey.

tests, aggregated to the school level. State percentiles for each school year were then calculated on the basis of the distribution of scores across all middle schools in the state.

School demographic data. School demographic data on enrollment, percentage of students of different races/ethnicities, percentage of students eligible for the federal school lunch program, percentage of English learner students, and the school's location (urban or rural) were extracted from publicly available school-level files in the California Department of Education's California Basic Education Data System.

Methodology

The results from a previous psychometric study of the student-level California Healthy Kids Survey dataset for California middle school students were used to specify the latent variable structure of survey items that measured school climate (Hanson & Voight, 2014). That study used exploratory and confirmatory factor analyses on split-half samples to identify six first-order factors that derived from the 39 California Healthy Kids Survey items: safety and connectedness, caring relationships with adults, meaningful student participation, substance use at school, bullying and discrimination, and student delinquency (Hanson & Voight, 2014). Because scores on these six factors all had adequate student- and school-level reliability and predictive validity, Hanson and Voight (2014) concluded that they represent reliable and valid measures of domains of school climate in middle schools.

In the current study student-level factor scores for the six first-order factors were estimated in a confirmatory factor analysis and extracted for subsequent analyses. A second-order confirmatory factor analysis was also estimated to assess the appropriateness of a global second-order school climate factor that is a function of the six first-order factors. Within each year of data collection, students' latent factor scores on each of the six first-order factors and the second-order factor were then aggregated to the school level to create school averages. If a school recorded fewer than 20 student responses on the California Healthy Kids Survey in any given year, data from that school in that year were eliminated from the analyses. State percentiles for each year were then calculated based on the distribution of scores across all middle schools with survey data.

The subsequent school-level datasets were merged with the school demographics dataset, resulting in a single school-level dataset that included all study variables in each study year. Thus each school had seven variables (2004/05–2010/11) for each school climate domain, English language arts test score, math test score, and demographic characteristic. This dataset was then converted from wide format to long format so that each case represented each possible school and year combination; the dataset was used to answer the research questions.

The first research question on how school climate is associated with English language arts and math test scores across schools was addressed using between-schools regression, which is equivalent to estimation based on school averages. The between-schools model can be written as:

$$\bar{y}_i = \alpha + \beta_1 \bar{\boldsymbol{x}}_i + \mu_i + \bar{\varepsilon}_i$$

where y is alternately average English language arts or math test scores in school i (averaging across t), and $\boldsymbol{x}$ is a vector of same-year predictor variables, also averaged over time,

that includes the school climate value for school *i* along with controls for the demographic composition of school *i* (for example, enrollment, urban/rural status, and percentages of students who are Black, Asian or Pacific Islander, Hispanic, other race/ethnicity, English learner students, and eligible for the federal school lunch program). The regression coefficient associated with the school climate predictor captures the extent to which average test scores vary across schools as school climate values vary, taking into account school-to-school differences in demographic composition. Models were estimated separately for each school climate domain and subdomain and for each outcome (English language arts and math test scores), resulting in 14 separate regression models.

The second research question on how changes in school climate are associated with changes in English language arts and math scores within the same school over time was addressed using fixed-effects modeling. Fixed-effects regression allows for an assessment of the relationship between climate and achievement, while controlling for all stable school characteristics that may otherwise bias the estimation of this association (Allison, 2009). The estimated model is described by the equation:

$$y_{it} = \mu_t + \beta_1 x_{it} + \beta_2 y_{i(t-2)} + \alpha_i + \varepsilon_{it}$$

where y is alternately average English language arts or math test scores in school i in year t, μ is the year-specific intercept of climate, and x is a vector of same-year predictor variables (school climate and demographic controls) for school i. A school's average test scores from two years prior to the year in which the outcome variable is assessed, $y_{i(t-2)}$, is also included as a control. The outcome is lagged by two years instead of one year because school climate data were typically collected biennially. The fixed effect is represented by α, which represents all differences between schools that are stable over time. The fixed-effects method uses variation in the outcome and predictor variables within individual schools to examine how a school's climate is associated with its academic performance. The regression coefficient associated with the school climate predictor can be interpreted as the contemporaneous association between a school's climate and its test scores, taking into account all unchanging features of the school as well as potentially time-variant school demographics. The only plausible alternative explanations for the relationship between climate and test scores would be attributable to time-variant school characteristics that were not included among the model control variables (such as staff retention and student mobility).

Determining the metrics of the school climate and academic test score measures

To make the results easier to interpret, school climate and academic performance school averages were converted into state percentiles based on the distribution of scores across California middle schools. The coefficient estimates presented in this report reflect the percentile point difference or change in academic performance that is associated with a 1 percentile point difference (research question 1) or change in school climate. To ensure that estimates were not affected by converting the scores into percentiles, the study team also estimated the associations between school climate and academic performance using a standard deviation metric.

School climate and academic performance school averages were transformed into standard deviation metrics by subtracting the sample mean from each observation and dividing that difference by the overall standard deviation. When standard deviations are used as

a metric, the results indicate the difference in academic performance, reported in standard deviations, associated with a one standard deviation difference in school climate. The school climate and academic performance metrics were converted into standard deviations because the existing metrics of these measures (scale scores and factor scores) are difficult to interpret. Results using both percentile point and standard deviation metrics are shown in appendix C to allow for comparisons between the two approaches.

Appendix C. Cross-sectional and longitudinal associations between school climate and academic performance in percentile point and standard deviation metrics

This appendix provides estimates in percentile points and standard deviations of the cross-sectional (table C1) and longitudinal (table C2) associations between school climate and academic achievement.

Table C1. Comparison of cross-sectional association between school climate and academic performance in California middle schools using percentile point and standard deviation metrics, by subject, 2004/05–2010/11

Measure	Difference in average English language arts test score		Difference in average math test score	
	Percentile points[a]	Standard deviations	Percentile points[a]	Standard deviations
School climate[b]	0.25*	0.25*	0.34*	0.35*
School climate domains				
Safety and connectedness	0.25*	0.26*	0.35*	0.35*
Caring relationships with adults	0.16*	0.16*	0.23*	0.24*
Meaningful student participation	0.15*	0.15*	0.23*	0.23*
Substance use at school	–0.26*	–0.27*	–0.35*	–0.36*
Bullying and discrimination	–0.13*	–0.13*	–0.21*	–0.21*
Student delinquency	–0.26*	–0.26*	–0.34*	–0.35*

* Statistically different from zero at the .05 level using a two-tailed test.

Note: Values are school averages across all available years of data from 14 between-school regression models that were estimated separately for each school climate measure and each academic performance outcome. The models also included controls for percentages of students who are Black, Hispanic, eligible for the federal school lunch program, and English learner students. The analytic sample consisted of 978 schools and 3,069 observation points, one for each year/school combination that could be included in the analyses.

a. Values are percentile point differences in academic performance between a school with an average student-reported school climate value that is 1 percentile point higher than that of another school.

b. To calculate the value for overall school climate, the survey results for substance use at school, bullying and discrimination, and student delinquency were reverse-coded such that high results on these domains refer to more positive school climates.

Source: Authors' analysis based on 2004/05–2010/11 data from the California Healthy Kids Survey and the California Department of Education's Standardized Testing and Reporting program.

Table C2. Longitudinal association between school climate and academic performance in California middle schools using percentile point and standard deviation metrics, by subject, 2006/07–2010/11

Measure	Change in average English language arts test score		Change in average math test score	
	Percentile points[a]	Standard deviations	Percentile points[a]	Standard deviations
School climate[b]	0.05*	0.05*	0.07*	0.07*
School climate domains				
Safety and connectedness	0.05*	0.05*	0.09*	0.09*
Caring relationships with adults	0.04*	0.04*	0.07*	0.07*
Meaningful student participation	0.02*	0.02*	0.02	0.02
Substance use at school	–0.05*	–0.06*	–0.06*	–0.06*
Bullying and discrimination	–0.01	–0.01	–0.04*	–0.04*
Student delinquency	–0.05*	–0.05*	–0.07*	–0.07*

* Statistically different from zero at the .05 level using a two-tailed test.

Note: Values are from fixed-effects regression models that included fixed-effects (dummy variables) for each school and controls for percentages of students who are Black, Hispanic, eligible for the federal school lunch program, and English learner students. The models also controlled for average test scores, measured two years prior to the test score outcome. The analytic sample consisted of 973 schools and 2,131 observation points, on for each year/school combination that could be included in the analyses. Five schools and 12 observation points were excluded from the sample because of missing test score data measured in the same year as school climate or measured two years prior to the test score outcome.

a. Values are percentile point differences in academic performance at a school in which there is a 1 percentile point increase in the average student-reported school climate value over a two-year period.

b. To calculate the value for overall school climate, the survey results for substance use at school, bullying and discrimination, and student delinquency were reverse-coded such that high results on these domains refer to more positive school climates.

Source: Authors' analysis based on 2006/07 to 2010/11 data from the CHKS and 2004/05 to 2010/11 data from the California Department of Education's Standardized Testing and Reporting program.

Notes

1. Facilitated by Regional Educational Laboratory West, the School Climate Alliance comprises 11 school districts, 16 schools, and the California Department of Education.
2. On average, 67 percent of enrolled grade 7 students participated in the survey over the 2004/05–2010/11 period (see appendix B).

References

Allison, P. D. (2009). *Fixed effects regression models*. Thousand Oaks, CA: Sage.

Bowen, G. L., Rose, R. A., & Ware, W. B. (2006). The reliability and validity of the School Success Profile Learning Organization Measure. *Evaluation and Program Planning, 29*(1), 97–104.

Bradshaw, C. P., Koth, C. W., Thornton, L.A., & Leaf, P. J. (2009). Altering school climate through school-wide Positive Behavioral Interventions and Supports: Findings from a group-randomized effectiveness trial. *Prevention Science, 10*(2), 100–115

Bradshaw, C. P., Mitchell, M. M., & Leaf, P. J. (2010). Examining the effects of school-wide positive behavior interventions and supports on student outcomes: Results from a randomized controlled effectiveness trial in elementary schools. *Journal of Positive Behavior Interventions, 12*(3), 133–148. http://eric.ed.gov/?id=EJ889024

Brand, S., Felner, R., Shim, M., Seitsinger, A., & Dumas, T. (2003). Middle school improvement and reform: Development of validation of a school-level assessment of climate, cultural pluralism, and school safety. *Journal of Educational Psychology*, *95*(3), 570–588.

Bryk, A., Sebring, P. B., Allensworth, E., Luppescu, S., & Easton, J. Q. (2010). *Organizing schools for improvement: Lessons from Chicago*. Chicago, IL: University of Chicago Press.

California Department of Education. (2013). *DataQuest*. Sacramento, CA: Author. Retrieved from http://dq.cde.ca.gov/dataquest/.

California Office to Reform Education. (2013). *ESEA flexibility: Request for window 3*. Washington, DC: U.S. Department of Education. Retrieved May 29, 2013, from http://www2.ed.gov/nclb/freedom/local/flexibility/waiverletters2009/cacoreflexrequest22013.pdf.

Center on Positive Behavioral Intervention and Supports. (2004). *School-wide positive behavior support: Implementers' blueprint and self-assessment*. Washington, DC: U.S. Department of Education.

Cohen, J., McCabe, E. M., Michelli, N. M., & Pickeral, T. (2009). School climate: Research, policy, practice, and teacher education. *Teachers College Record, 111*(1), 180–213. http://eric.ed.gov/?id=EJ826002

Collaborative for Academic, Social, and Emotional Learning. (2003). *Safe and sound: An educational leader's guide to evidence-based social and emotional learning (SEL) programs*. Chicago, IL: Author. http://eric.ed.gov/?id=ED505373

Durlak, J. A., Weissberg, R. P., Dymnicki, A. B., Taylor, R. D., & Schellinger, K. B. (2011). The impact of enhancing students' social and emotional learning: A meta-analysis of school-based universal interventions. *Child Development, 82*(1): 405–432. http://eric.ed.gov/?id=EJ927868

Eccles, J. S., Wigfield, A., Midgley, C., Reuman, D., MacIver, D., & Feldlaufer, H. (1993). Negative effects of traditional middle schools on students' motivation. *The Elementary School Journal, 93*(54), 553–574.

Education Data Partnership. (2015). *Enrollment by grade, State of California, 2010–11.* Sacramento, CA: Author. Retrieved July 14, 2014, from http://www.ed-data.k12.ca.us/App_Resx/EdDataClassic/fsTwoPanel.aspx?#!bottom=/_layouts/EdDataClassic/profile.asp?tab=0&level=04&ReportNumber=16&fyr=1112#enrollmentbygrade.

Hanson, T., & Voight, A. (2014). *The appropriateness of a California student and staff school climate survey for measuring middle school climate* (REL 2014–039). Washington, DC: U.S. Department of Education, Institute of Education Sciences, National Center for Education Evaluation and Regional Assistance, Regional Educational Laboratory West. http://eric.ed.gov/?id=ED546900

Hopson, L. M., & Lee, E. (2011). Mitigating the effect of family poverty on academic and behavioral outcomes: The role of school climate in middle and high school. *Children and Youth Services Review, 33*(11), 2221–2229.

Horner, R. H., Sugai, G., Smolkowski, K., Eber, L., Nakasato, J., Todd, A. W., et al. (2009). A randomized, wait-listed controlled effectiveness trial assessing school-wide positive behavior support in elementary schools. *Journal of Positive Behavior Interventions, 11*(3), 133–144. http://eric.ed.gov/?id=EJ842264

Lee, V. E., & Smith, J. B. (1999). Social support and achievement for young adolescents in Chicago: The role of school academic press. *American Educational Research Journal, 36*(4), 907–945.

Ma, X., & Klinger, D. A. (2000). Hierarchical linear modeling of student and school effects on academic achievement. *Canadian Journal of Education*, *25*(1), 41–55.

Mattison, E., & Aber, M. S. (2007). Closing the achievement gap: The association of racial climate with achievement and behavioral outcomes. *American Journal of Community Psychology*, *40*(1), 1–12.

Muthén, B. O. (1984). A general structural equation model with dichotomous, ordered, categorical, and continuous latent variable indicators. *Psychometrica*, *49*, 115–132.

Niebuhr, K. E., & Niebuhr, R. E. (1999). An empirical study of student relationships and academic achievement. *Education, 119*(4), 679–681.

Osher, D., Bear, G. G., Sprague, J. R., & Doyle, W. (2010). How can we improve school discipline? *Educational Researcher, 39*(1), 48–58. http://eric.ed.gov/?id=EJ886493

Piscatelli, J., & Lee, C. (2011). *State policies on school climate and bullying prevention efforts: Challenges and opportunities for deepening state policy support for safe and civil schools*. New York, NY: National School Climate Center. Retrieved May 29, 2013, from http://www.schoolclimate.org/climate/documents/policy_brief.pdf.

Stewart, E. B. (2008). School structural characteristics, student effort, peer associations, and parental involvement: The influence of school- and individual-level factors on academic achievement. *Education & Urban Society*, *40*(2), 179–204. http://eric.ed.gov/?id=EJ781142

Taylor, M. (2013). *An overview of the Local Control Funding Formula.* Sacramento, CA: Legislative Analyst's Office.

Uline, C., & Tschannen-Moran, M. (2008). The walls speak: The interplay of quality facilities, school climate, and student achievement. *Journal of Educational Administration*, *46*(1), 55–73. http://eric.ed.gov/?id=EJ800471

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