

Academic Mindsets and Behaviors, Prior Achievement, and the Transition to Middle School

Appendix A. Survey measures

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Appendix D. Subgroup analysis

See <https://go.usa.gov/xMGUH> for the full report.

Appendix A. Survey measures

The study relied on survey measures of student academic mindsets and behaviors. In particular, the analysis employed measures of growth mindset, performance avoidance, and academic behaviors. Previous research showed these measures to be reliable and to be valid predictors of student outcomes (Farrington et al., 2014; Snipes & Tran, 2016, 2017).

Table A1 shows the survey items and estimated reliability for each measure from the Becoming Effective Learners Project (Farrington et al., 2014), calculated using Cronbach's alpha (Cronbach, 1951). Table A2 shows the range of each scale and the reliability of each measure from the Clark County School District (CCSD) survey (Snipes & Tran, 2017). All items were weighted equally, and the total was divided by the number of items to produce the scale score. There are slight wording changes from the Becoming Effective Learners Project survey to the CCSD survey, which were made at the request of CCSD. However, in both cases each of the measures was shown to have internal reliability that met or exceeded Nunnally's (1978) criteria of .7 or higher and to be a statistically significant predictor of student academic outcomes, including grades, standardized test scores, and on-track status for graduation (Farrington et al., 2014; Snipes & Tran, 2016).

Table A1. Reliability and content of the Becoming Effective Learners Survey measures

Measure	Reliability	Content
Growth mindset	.71	How true are the following about you? <ol style="list-style-type: none">1. My intelligence is something that I can't change very much.2. Challenging myself won't make me any smarter.3. There are some things I am not capable of learning.4. If I am not naturally smart in a subject, I will never do well in it. <i>Not at all true, A little true, Somewhat true, Mostly true, Completely true (reverse coded)</i>
Performance avoidance	.82	How true are the following about you? <ol style="list-style-type: none">1. I don't participate in discussions because I am afraid people might think I am dumb.2. I would rather do easy work that I can do well than challenging work where I might learn more.3. I don't ask questions in class because people might think my questions are stupid.4. I stop doing work if I feel like I can't do it well.5. I only volunteer to answer a question if I am sure my answer is right. <i>Not at all true, A little true, Somewhat true, Mostly true, Completely true</i>
Academic behaviors (attendance, participation, and studying)	.78	How often do you: <ol style="list-style-type: none">1. Do the readings or other assigned work to prepare for class.2. Turn in assignments on the due date.3. Actively participate in class.4. Have all of my class materials with me.5. Do more than what is expected of me. <i>Never, Once in a while, About half the time, Most of the time, Always</i>

Source: Farrington et al., 2014.

Table A2. Reliability and content of Clark County School District survey measures

Measure	Reliability	Content
Growth mindset	.75	How true are the following about you? 1. My intelligence is something that I can't change very much. 2. Challenging myself won't make me any smarter. 3. There are some things I am not capable of learning. 4. If I am not naturally smart in a subject, I will never do well in it. <i>Not at all true, A little true, Somewhat true, Mostly true, Completely true (reverse coded)</i>
Performance avoidance	.77	In a typical class, how true are the following? 1. I don't participate in discussions because I am afraid people might think I am foolish. 2. I would rather do easy work that I can do well than challenging work where I might learn more. 3. I don't ask questions in class because people might think my questions are not smart. 4. I stop doing work if I feel like I can't do it well. 5. I only volunteer to answer a question if I am sure my answer is right. <i>Not at all true, A little true, Somewhat true, Mostly true, Completely true</i>
Academic behaviors (attendance, participation, and studying)	.74	In a typical class, how often do you: 1. Do the readings or other assigned work to prepare for class. 2. Turn in assignments on the due date. 3. Actively participate in class. 4. Have all of my class materials with me. 5. Do more than what is expected of me. <i>Never, Once in a while, About half the time, Most of the time, Always</i>

Note: Calculations based on districtwide data from 2015 (Snipes & Tran, 2017).

Source: Snipes & Tran, 2017.

References

- Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika*, 16(3), 297–334.
- Farrington, C. A., Levenstein, R., & Keyes, T. S. (2014, April). *Developing and validating measures of noncognitive factors for middle school and high school students: The Becoming Effective Learners student pilot survey*. Paper presented at the American Educational Research Association (AERA) annual meeting, Philadelphia, PA.
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- Snipes, J., & Tran, L. (2016). *Early indicators and academic mindsets in the Clark County School District*. REL West at WestEd.
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Appendix B. Detailed results

This appendix reports the detailed results of the multilevel logistic regressions for the analyses discussed in the main report, as well as the results of multilevel models that use the same measures to predict grade point average (GPA) as a continuous variable instead of a dichotomous variable (having a GPA below 2.0 or not). In addition, this appendix contains estimates that can shed light on the patterns among the academic mindset and behavior measures. It focuses on the extent to which growth mindset and performance avoidance predict academic behaviors.

The predicted probabilities presented here translate specific values of predictors and logistic regression coefficients into predicted probabilities of having a GPA below 2.0 in the first semester of grade 6 using the following equation, $\widehat{Prob}(GPA < 2.0) = \frac{1}{1 + e^{-\beta X}}$, where β represents the set of coefficients generated from the logistic regression, and X represents the specific values of the characteristics being used to predict the outcome.

Although significance varies for growth mindset and performance avoidance individually, they were jointly significant in all of the models presented in this appendix. Because of the strong correlation between these two variables, both were kept in the models. The analyses and predictions focused on how predicted outcomes changed when all of the academic mindset and behavior variables moved together (which they tend to do).

Primary and alternative models for all students (model 1)

The results of the multilevel logistic models document the relationships that form the basis of the predictions presented in the main report (table B1). The analysis predicting GPA with the same measures (table B2) shows that essentially the same pattern as discussed in the main report exists even if continuous GPA is used as the outcome instead of dichotomous GPA (below 2.0 or not). Therefore, the dynamics discussed in the main report do not apply solely to the lower-achieving segment of the student population. Finally, the analysis predicting academic behavior levels using only growth mindset and performance avoidance shows that both growth mindset and performance avoidance are significant predictors. As expected, performance avoidance exhibits a negative relationship with academic behaviors. While growth mindset shows a positive relationship with academic behaviors, the point estimate is an order of magnitude smaller than the point estimate for performance avoidance (table B3).

Table B1. Full regression results for all students for the primary model: Dependent variable of grade point average below 2.0 in the first semester of grade 6 (odds ratios)

Variable	Model 1	Model 1a	Model 2
Academic behavior score (standardized)	0.729*** (0.0171)		0.734*** (0.0191)
Performance avoidance score (standardized)	1.352*** (0.0367)		1.103** (0.0331)
Growth mindset score (standardized)	0.731*** (0.0199)		0.987 (0.0316)
Average SBAC scores (standardized)		0.177*** (0.00574)	0.189*** (0.00660)
Constant (fixed effects)	0.174*** (0.0173)	0.0951*** (0.0103)	0.0911*** (0.0101)
Random effects parameter (standard deviation of the constant)	0.752** (0.0780)	0.802* (0.0837)	0.820 (0.0859)
Number of observations	19,336	19,336	19,336
Number of groups	63	63	63

* Significant at $p < .05$; ** significant at $p < .01$; *** significant at $p < .001$.

SBAC is Smarter Balanced Assessment Consortium standardized state tests.

Note: Sample size = 19,336 students. Values in parentheses are standard errors. An odds ratio of > 1 suggests a positive relationship, while an odds ratio of < 1 indicates a negative relationship. The predicted mean matching method was used for imputation of missing values. All models predict whether a student had a low GPA in the first semester of grade 6. Model 1 accounts for only grade 5 student-reported measures of academic mindsets and behaviors, while model 1a accounts for only grade 5 test scores. Model 2 accounts for both academic mindsets and behaviors and test scores in grade 5.

Source: Authors' analysis of 2016/17 and 2017/18 Clark County School District student records data.

Table B2. Full regression results for all students for the alternative model with a continuous measure of grade point average in the first semester of grade 6 as the dependent variable

Variable	Model 1	Model 1a	Model 2
Academic behavior score (standardized)	0.137*** (0.00795)		0.107*** (0.00588)
Performance avoidance score (standardized)	-0.139*** (0.00903)		-0.0271*** (0.00693)
Growth mindset score (standardized)	0.165*** (0.00875)		0.00271 (0.00690)
Average SBAC scores (standardized)		1.941*** (0.0101)	0.633*** (0.00585)
Constant (fixed effects)	0.0654 (0.0438)	1.109** (0.0421)	0.104** (0.0379)
Random effects parameter (standard deviation of the constant)	0.341*** (0.0317)	0.297*** (0.0275)	0.296*** (0.0274)
Number of observations	19,336	19,336	19,336
Number of groups	63	63	63

** Significant at $p < .01$; *** significant at $p < .001$.

SBAC is Smarter Balanced Assessment Consortium standardized state tests.

Note: Sample size = 19,336 students. Values in parentheses are standard errors. The predicted mean matching method was used for imputation of missing values. All models predict a student's continuous GPA in the first semester of grade 6, rather than a dichotomous variable denoting having a GPA below 2.0 or not. Otherwise, these models follow the pattern set in table B1, starting with academic mindsets and behaviors (model 1), then test scores (model 1a), and then both (model 2).

Source: Authors' analysis of 2016/17 and 2017/18 Clark County School District student records data.

Table B3. Full regression results for a test of the relationship between student reports of the level of academic behavior levels (dependent variable) and other academic mindsets (growth mindset) and behaviors (performance avoidance)

Variable	Result
Growth mindset (standardized)	0.036*** (0.0094)
Performance avoidance score (standardized)	-0.312*** (0.0100)
Constant (fixed effects)	-0.010*** (0.0149)
Random effects parameter (standard deviation of the constant)	0.0918*** (0.0151)
Number of observations	19,336
Number of groups	63

* Significant at $p < .001$.

Note: Sample size = 19,336 students. Values in parentheses are standard errors. Student reports are from responses to a Clark County School District (CCSD) survey (Snipes & Tran, 2017). The predicted mean matching method was used for imputation of missing values.

Source: Authors' analysis of 2016/17 and 2017/18 Clark County School District student records data.

Student group models (model 2)

The following tables report the results of analyses predicting whether a student’s GPA is below 2.0 in the first semester of grade 6 for specific subgroups based on prior academic achievement. Specifically, this includes students below the 25th percentile, from the 25th to the 50th percentile, and in the 51st percentile and above with respect to grade 5 academic achievement. Analysis is reported for all students (table B4) as well as specific sociodemographic subgroups including Black students (table B5), Latinx students (table B6), White and Asian students (table B7), English learner students (table B8), and non–English learner students (table B9).

Table B4. Full model regression results for all students by prior academic achievement group (odds ratios)

Variable	Below 25th percentile	From the 25th to 50th percentile	51st percentile and above
Academic behavior score (standardized)	0.774*** (0.0283)	0.736*** (0.0371)	0.619*** (0.0406)
Performance avoidance score (standardized)	1.141** (0.0492)	1.071 (0.0583)	1.038 (0.0854)
Growth mindset (standardized)	0.998 (0.0436)	0.967 (0.0538)	0.970 (0.0839)
Average SBAC scores (standardized)	0.237*** (0.0210)	0.202*** (0.0374)	0.193*** (0.0282)
Constant (fixed effects)	0.124*** (0.0195)	0.0995*** (0.0128)	0.0836*** (0.0124)
Random effects parameter (standard deviation of the constant)	0.817 (0.0903)	0.731** (0.0882)	0.821 (0.113)
Joint significance test of all behaviors and mindset measures	24.73***	18.39***	20.29***
Number of observations	4,836	4,840	9,612
Number of groups	63	63	63

** Significant at $p < .01$; *** significant at $p < .001$.

SBAC is Smarter Balanced Assessment Consortium standardized state tests.

Note: Sample size = 19,336 students. Values in parentheses are standard errors. An odds ratio of > 1 suggests a positive relationship, while an odds ratio of < 1 indicates a negative relationship. Prior academic achievement is measured as the average of math and English language arts grade 5 SBAC scores. The predicted mean matching method was used for imputation of missing values.

Source: Authors’ analysis of 2016/17 and 2017/18 Clark County School District student records data.

Table B5. Full model regression results for Black students by prior academic achievement group (odds ratios)

Variable	Below 25th percentile	From the 25th to 50th percentile	51st percentile and above
Academic behavior score (standardized)	0.780** (0.0694)	0.801 (0.103)	0.634* (0.128)
Performance avoidance score (standardized)	1.113 (0.110)	1.139 (0.171)	1.168 (0.325)
Growth mindset (standardized)	1.053 (0.104)	1.133 (0.154)	1.123 (0.323)
Average SBAC scores (standardized)	0.218*** (0.0417)	0.139*** (0.0675)	0.264* (0.149)
Constant (fixed effects)	0.166*** (0.0447)	0.123*** (0.0324)	0.0641*** (0.0264)
Random effects parameter (standard deviation of the constant)	0.663* (0.117)	0.852 (0.163)	0.801 (0.374)
Joint significance test of all behaviors and mindset measures	3.60*	1.72	2.17
Number of observations	995	637	665
Number of groups	57	57	57

* Significant at $p < .05$; ** significant at $p < .01$; *** significant at $p < .001$.

SBAC is Smarter Balanced Assessment Consortium standardized state tests.

Note: Sample size = 19,336 students. Values in parentheses are standard errors. An odds ratio of > 1 suggests a positive relationship, while an odds ratio of < 1 indicates a negative relationship. Prior academic achievement is measured as the average of math and English language arts grade 5 SBAC scores. The predicted mean matching method was used for imputation of missing values.

Source: Authors' analysis of 2016/17 and 2017/18 Clark County School District student records data.

Table B6. Full model regression results for Latinx students by prior academic achievement group (odds ratio)

Variable	Below 25th percentile	From the 25th to 50th percentile	51st percentile and above
Academic behavior score (standardized)	0.778*** (0.0361)	0.746*** (0.0503)	0.687*** (0.0667)
Performance avoidance score (standardized)	1.197** (0.0686)	1.056 (0.0790)	1.140 (0.134)
Growth mindset (standardized)	0.952 (0.0542)	0.900 (0.0658)	0.965 (0.105)
Average SBAC scores (standardized)	0.244*** (0.0283)	0.204*** (0.0519)	0.177*** (0.0384)
Constant (fixed effects)	0.124*** (0.0233)	0.0923*** (0.0142)	0.104*** (0.0181)
Random effects parameter (standard deviation of the constant)	0.820 (0.0967)	0.690** (0.0961)	0.780 (0.136)
Joint significance test of all behaviors and mindset measures	18.25***	10.56***	7.99***
Number of observations	2,918	2,668	3,884
Number of groups	63	63	63

** Significant at $p < 0.01$; *** significant at $p < 0.001$.

SBAC is Smarter Balanced Assessment Consortium standardized state tests.

Note: Sample size = 19,336 students. Values in parentheses are standard errors. An odds ratio of > 1 suggests a positive relationship, while an odds ratio of < 1 indicates a negative relationship. Prior academic achievement is measured as the average of math and English language arts grade 5 SBAC scores. The predicted mean matching method was used for imputation of missing values.

Source: Authors' analysis of 2016/17 and 2017/18 Clark County School District student records data.

Table B7. Full model regression results for White and Asian students by prior academic achievement group (odds ratio)

Variable	Below 25th percentile	From the 25th to 50th percentile	51st percentile and above
Academic behavior score (standardized)	0.685*** (0.0705)	0.697*** (0.0708)	0.500*** (0.0676)
Performance avoidance score (standardized)	1.047 (0.136)	1.048 (0.129)	0.814 (0.131)
Growth mindset (standardized)	0.979 (0.129)	0.897 (0.108)	0.901 (0.149)
Average SBAC scores (standardized)	0.345*** (0.0886)	0.265** (0.108)	0.188*** (0.0497)
Constant (fixed effects)	0.168*** (0.0573)	0.0999*** (0.0201)	0.0528*** (0.0141)
Random effects parameter (standard deviation of the constant)	0.742 (0.150)	0.572* (0.149)	1.076 (0.212)
Joint significance test of all behaviors and mindset measures	4.85**	6.30***	9.14***
Number of observations	637	1,141	4,050
Number of groups	62	60	61

* Significant at $p < .05$; ** significant at $p < .01$; *** significant at $p < .001$.

SBAC is Smarter Balanced Assessment Consortium standardized state tests.

Note: Sample size = 19,336 students. Values in parentheses are standard errors. An odds ratio of > 1 suggests a positive relationship, while an odds ratio of < 1 indicates a negative relationship. Prior academic achievement is measured as the average of math and English language arts grade 5 SBAC scores. The predicted mean matching method was used for imputation of missing values.

Source: Authors' analysis of 2016/17 and 2017/18 Clark County School District student records data.

Table B8. Full model regression results for English learner students by prior academic achievement group (odds ratio)

Variable	Below 25th percentile	From the 25th to 50th percentile	51st percentile and above
Academic behavior score (standardized)	0.804*** (0.0448)	0.832 (0.105)	0.675 (0.321)
Performance avoidance score (standardized)	1.144 (0.0824)	0.992 (0.142)	0.780 (0.437)
Growth mindset (standardized)	0.956 (0.0689)	0.958 (0.137)	0.758 (0.395)
Average SBAC scores (standardized)	0.280*** (0.0408)	0.201** (0.112)	0.144 (0.261)
Constant (fixed effects)	0.158*** (0.0370)	0.104*** (0.0347)	0.126*** (0.0793)
Random effects parameter (standard deviation of the constant)	0.804 (0.105)	1.031 (0.204)	2.00e-09 (94.54)
Joint significance test of all behaviors and mindset measures	8.14***	0.80	0.27
Number of observations	1,657	591	96
Number of groups	62	53	39

** Significant at $p < .01$; *** significant at $p < .001$.

SBAC is Smarter Balanced Assessment Consortium standardized state tests.

Note: Sample size = 19,336 students. Values in parentheses are standard errors. An odds ratio of > 1 suggests a positive relationship, while an odds ratio of < 1 indicates a negative relationship. Prior academic achievement is measured as the average of math and English language arts grade 5 SBAC scores. The predicted mean matching method was used for imputation of missing values.

Source: Authors' analysis of 2016/17 and 2017/18 Clark County School District student records data.

Table B9. Full model regression results for non–English learner students by prior academic achievement group (odds ratio)

Variable	Below 25th percentile	From the 25th to 50th percentile	51st percentile and above
Academic behavior score (standardized)	0.753*** (0.0351)	0.716*** (0.0380)	0.616*** (0.0410)
Performance avoidance score (standardized)	1.143* (0.0622)	1.078 (0.0647)	1.045 (0.0879)
Growth mindset (standardized)	1.015 (0.0556)	0.978 (0.0602)	0.977 (0.0860)
Average SBAC scores (standardized)	0.207*** (0.0238)	0.205*** (0.0409)	0.194*** (0.0286)
Constant (fixed effects)	0.107*** (0.0191)	0.0982*** (0.0129)	0.0829*** (0.0124)
Random effects parameter (standard deviation of the constant)	0.788* (0.0924)	0.716** (0.0892)	0.823 (0.114)
Joint significance test of all behaviors and mindset measures	17.56***	18.63***	20.20***
Number of observations	3,179	4,249	9,516
Number of groups	63	63	63

* Significant at $p < .05$; ** significant at $p < .01$; *** significant at $p < .001$.

SBAC is Smarter Balanced Assessment Consortium standardized state tests.

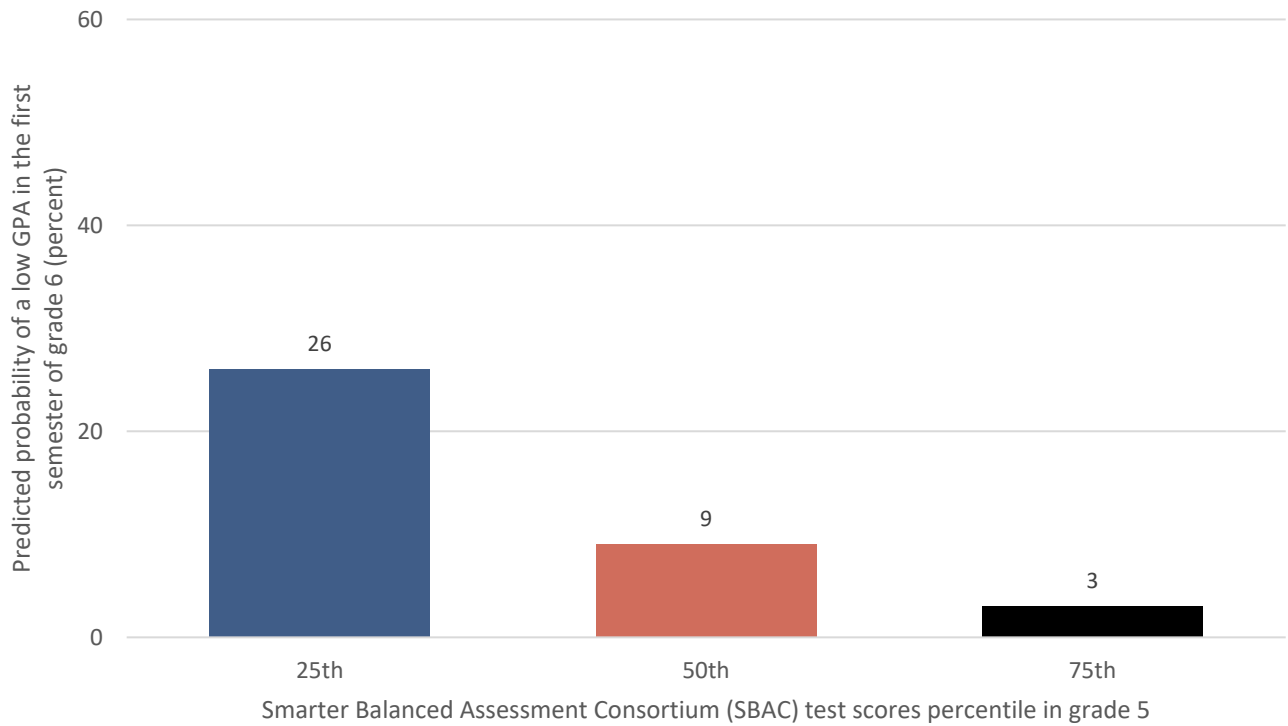
Note: Sample size = 19,336 students. Values in parentheses are standard errors. An odds ratio of > 1 suggests a positive relationship, while an odds ratio of < 1 indicates a negative relationship. Prior academic achievement is measured as the average of math and English language arts grade 5 SBAC scores. The predicted mean matching method was used for imputation of missing values.

Source: Authors' analysis of 2016/17 and 2017/18 Clark County School District student records data.

Model predictions

The figures below present the predicted probabilities of having a GPA below 2.0 in the first semester of grade 6 given specific values of predictors. For example, the figure B1 presents the predicted probabilities at three specific levels of achievement corresponding to the 25th, 50th, and 75th percentiles in the overall distribution. Figure B2 presents these probabilities for typical non–English learner students with low, median, and high levels of positive academic mindsets and behaviors in each prior achievement subgroup.

Figure B1. Higher grade 5 prior academic achievement predicted a lower probability of having a grade point average below 2.0 in the first semester of grade 6

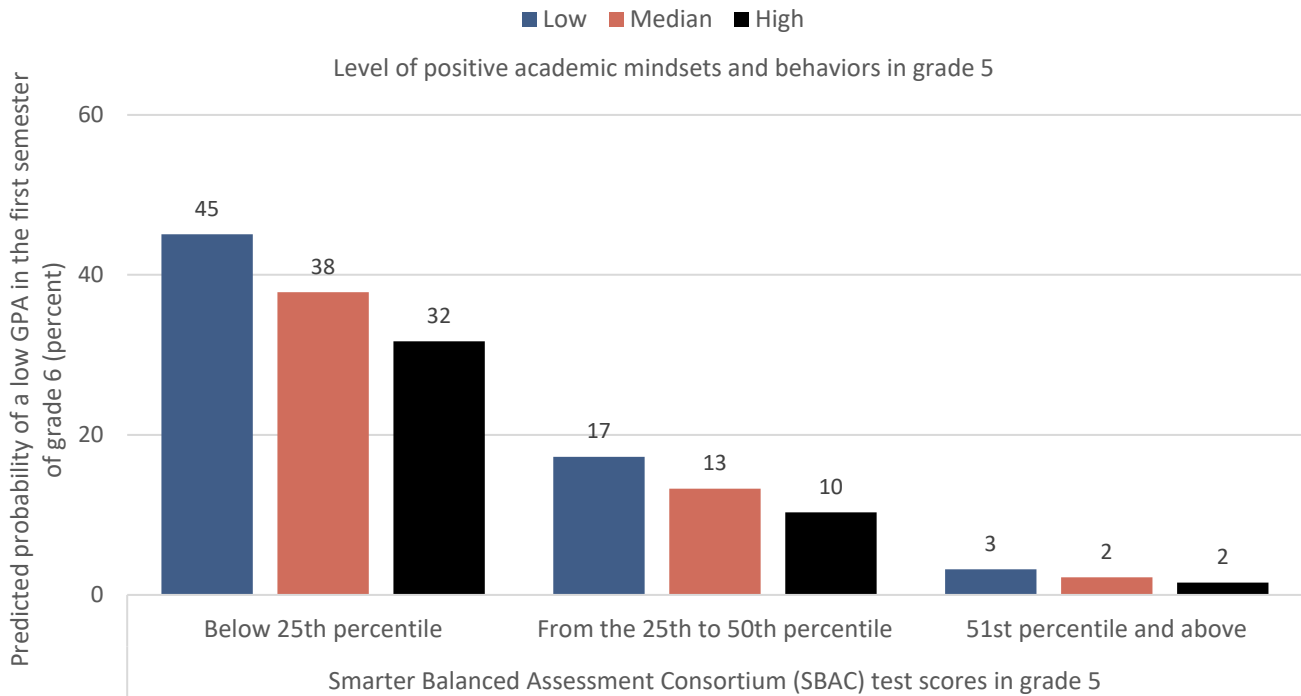


GPA is grade point average.

Note: Sample size = 19,336 students. Differences associated with each variable are statistically significant at $p < .001$. Prior academic achievement was defined as the average of grade 5 standardized SBAC scores in math and English language arts. The figure shows, for example, that students with SBAC scores at the 75th percentile in grade 5 had a 3 percent predicted probability of a low GPA in the first semester of grade 6, while students with SBAC scores at the 25th percentile had a 26 percent predicted probability. Predictions were based on a multilevel logistic regression using student grade 5 SBAC scores to predict a dichotomous variable indicating whether a student had a first-semester grade 6 GPA below 2.0 at specific points in the distribution of SBAC scores including the 25th, 50th, and 75th percentiles. The predicted mean matching method was used for imputation of missing values.

Source: Authors' analysis of 2016/17 and 2017/18 Clark County School District student records data.

Figure B2. After individual differences in 2016/17 grade 5 students’ prior academic achievement were controlled for, the relationship between grade 5 academic mindsets and behaviors and first-semester grade 6 grade point average among non–English learner students was meaningful only among students with prior academic achievement below the district median

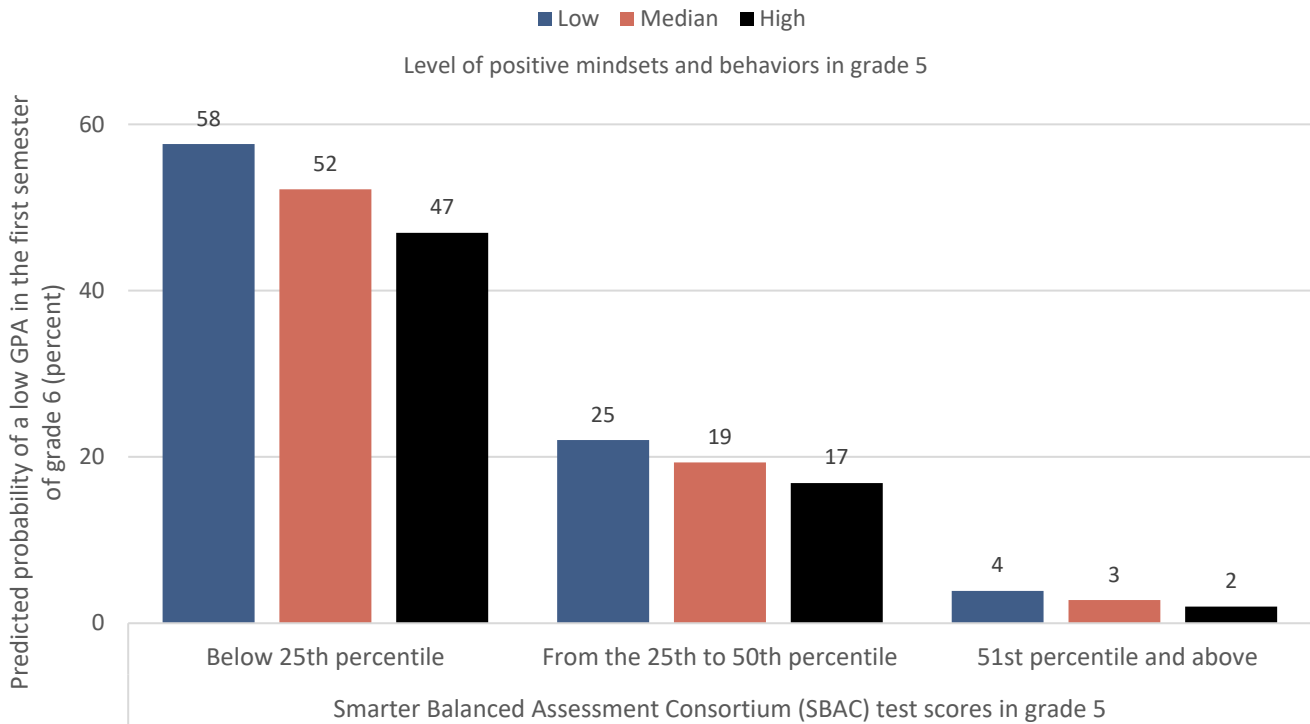


GPA is grade point average.

Note: Sample size = 3,179 students with prior academic achievement below the 25th percentile, 4,249 students with prior academic achievement from the 25th to the 50th percentile, and 9,516 students with prior academic achievement at the 51st percentile and above. The *F*-statistics for a joint significance test for all behaviors and mindset variables for each model were as follows: 17.56 ($p < .001$), 18.63 ($p < .001$), and 20.2 ($p < .001$). Prior academic achievement was defined as the average of grade 5 standardized SBAC scores in math and English language arts. The figure shows, for example, that non–English learner students with average grade 5 SBAC scores below the 25th percentile and with a low level of positive academic mindsets and behaviors in grade 5 had a 45 percent predicted probability of having a low GPA in the first semester of grade 6. Non–English learner students with average grade 5 SBAC scores below the 25th percentile and with a median level of positive academic mindsets and behaviors in grade 5 had a 38 percent predicted probability of a low GPA in the first semester of grade 6. And non–English learner students with average grade 5 SBAC scores below the 25th percentile and with a high level of positive academic mindsets and behaviors in grade 5 had a 32 percent predicted probability of a low GPA in the first semester of grade 6. A low level of positive academic mindsets and behaviors indicates scoring at the 25th percentile of growth mindset and academic behaviors and at the 75th percentile of performance avoidance, a median level indicates scoring at the median on all three measures, and a high level indicates scoring at the 75th percentile of growth mindset and academic behaviors and the 25th percentile of performance avoidance. Predictions were based on a multilevel logistic regression using student grade 5 reports of the levels of academic behavior, growth mindset, and performance avoidance and SBAC scores to predict a dichotomous variable indicating whether a student had a first-semester grade 6 GPA below 2.0 at each positive academic mindsets and behaviors level, with SBAC scores held constant at the median within a given student group. The predicted mean matching method was used for imputation of missing values.

Source: Authors’ analysis of 2016/17 and 2017/18 Clark County School District student records data.

Figure B3. After individual differences in 2016/17 grade 5 students' prior academic achievement were controlled for, the relationship between grade 5 academic mindsets and behaviors and first-semester grade 6 grade point average among Black students was meaningful only among students with scores below the district median

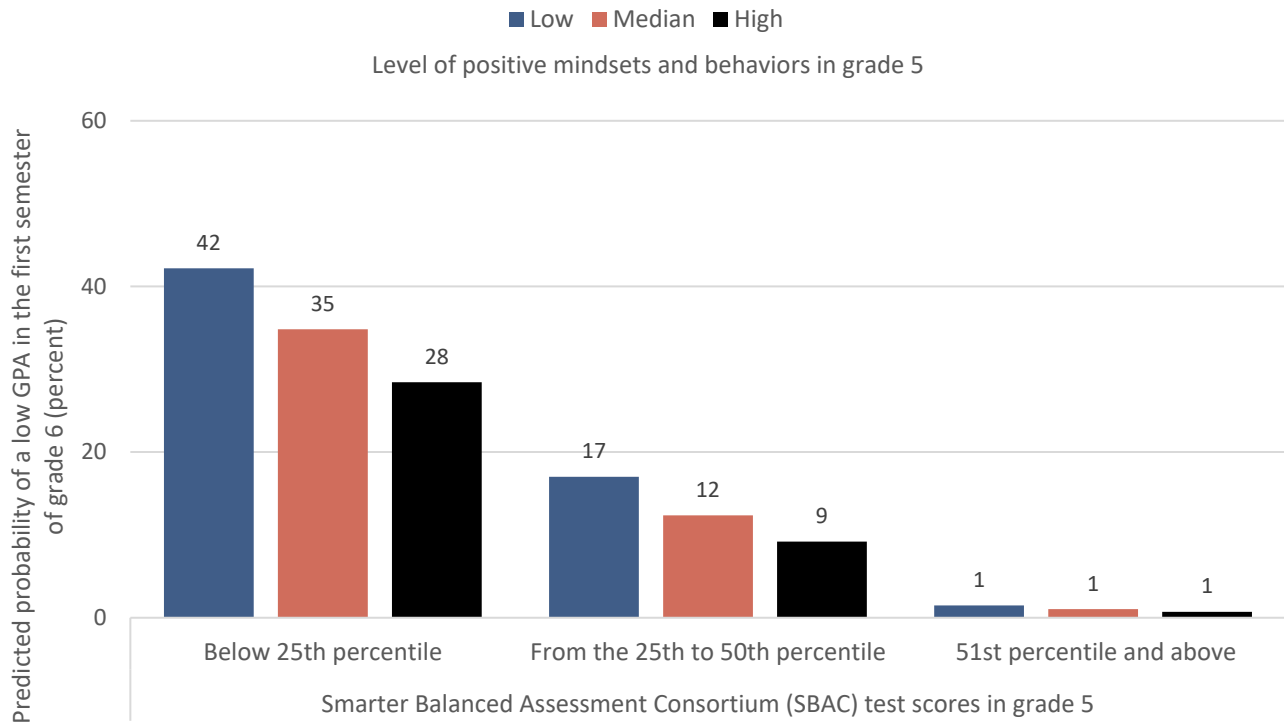


GPA is grade point average.

Note: Sample size = 995 students with prior academic achievement below the 25th percentile, 637 students with prior academic achievement from the 25th to the 50 percentile, and 665 students with prior academic achievement at the 51st percentile and above. The *F*-statistics for a joint significance test for all behaviors and mindset variables for each model were as follows: 3.6 ($p < .01$), 1.72 ($p > .05$), and 2.17 ($p > .05$). Prior academic achievement was defined as the average of grade 5 standardized SBAC scores in math and English language arts. The figure shows, for example, that Black students with average grade 5 SBAC scores below the 25th percentile and with a low level of positive academic mindsets and behaviors in grade 5 had a 58 percent probability of having a low GPA in the first semester of grade 6. Black students with average grade 5 SBAC scores below the 25th percentile and with a median level of positive academic mindsets and behaviors in grade 5 had a 52 percent probability of a low GPA in the first semester of grade 6. And Black students with average grade 5 SBAC scores below the 25th percentile and with a high level of positive academic mindsets and behaviors in grade 5 had a 47 percent probability of a low GPA in the first semester of grade 6. A low level of positive academic mindsets and behaviors indicates scoring at the 25th percentile of growth mindset and academic behaviors and at the 75th percentile of performance avoidance, a median level indicates scoring at the median on all three measures, and a high level indicates scoring at the 75th percentile of growth mindset and academic behaviors and the 25th percentile of performance avoidance. Predictions were based on a multilevel logistic regression using student grade 5 reports of the levels of academic behavior, growth mindset, and performance avoidance and SBAC scores to predict a dichotomous variable indicating whether a student had a first-semester grade 6 GPA below 2.0 at each positive academic mindsets and behaviors level, with SBAC scores held constant at the median within a given student group. The predicted mean matching method was used for imputation of missing values.

Source: Authors' analysis of 2016/17 and 2017/18 Clark County School District student records data.

Figure B4. After individual differences in grade 2016/17 5 students’ prior academic achievement were controlled for, the relationship between grade 5 academic mindsets and behaviors and first-semester grade 6 grade point average among Asian and White students was meaningful only among students with scores below the district median



GPA is grade point average.

Note: Sample size = 637 students with prior academic achievement below the 25th percentile, 1,141 students with prior academic achievement from the 25th to the 50th percentile, and 4,050 students with prior academic achievement at the 51st percentile and above. The *F*-statistics for a joint significance test for all behaviors and mindset variables for each model were as follows: 4.85 ($p < .01$), 6.3 ($p < .001$), and 9.14 ($p < .001$). Prior academic achievement was defined as the average of grade 5 standardized SBAC scores in math and English language arts. The figure shows, for example, that White and Asian students with average grade 5 SBAC scores below the 25th percentile and with a low level of positive academic mindsets and behaviors in grade 5 had a 42 percent probability of having a low GPA in the first semester of grade 6. White and Asian students with average grade 5 SBAC scores below the 25th percentile and with a median level of positive academic mindsets and behaviors in grade 5 had a 35 percent probability of a low GPA in the first semester of grade 6. And White and Asian students with average grade 5 SBAC scores below the 25th percentile and with a high level of positive academic mindsets and behaviors in grade 5 had a 28 percent probability of a low GPA in the first semester of grade 6. A low level of positive academic mindsets and behaviors indicates scoring at the 25th percentile of growth mindset and academic behaviors and at the 75th percentile of performance avoidance, a median level indicates scoring at the median on all three measures, and a high level indicates scoring at the 75th percentile of growth mindset and academic behaviors and the 25th percentile of performance avoidance. Predictions were based on a multilevel logistic regression using student grade 5 reports of the levels of academic behavior, growth mindset, and performance avoidance and SBAC scores to predict a dichotomous variable indicating whether a student had a first-semester grade 6 GPA below 2.0 at each positive academic mindsets and behaviors level, with SBAC scores held constant at the median within a given student group. The predicted mean matching method was used for imputation of missing values.

Source: Authors’ analysis of 2016/17 and 2017/18 Clark County School District student records data.

Reference

Snipes, J., & Tran, L. (2017). *Growth mindset, performance avoidance, and academic behaviors in Clark County School District* (REL 2017–226). U.S. Department of Education, Institute of Education Sciences, National Center for Education Evaluation and Regional Assistance, Regional Educational Laboratory West. <http://ies.ed.gov/ncee/edlabs>.

Appendix C. Missing data

Four key variables used in the analysis were missing for some students in the study’s target population. These included three survey score variables that represent averages of specific survey responses and relate to growth mindset, performance avoidance, and academic behaviors. Data for those variables were present for approximately 62 percent of the original sample. In addition, average test scores across two tested subjects, math and English language arts (ELA), were also missing data for a small percentage of students (0.2 percent). The study team used missing data correction to impute these missing data.

Table C1 compares sociodemographic characteristics for students with complete data and those missing data for at least one of variable.

Table C1. Differences between sample members with and without complete data

Characteristic	Students with complete data (n = 11,986) (percent)	Students with missing data (n = 7,350) (percent)	Difference (percentage points)
Gender			
Female	51	50	0.47
English learner status			
English learner student	12	12	0.17
Race/ethnicity			
American Indian	0	0	-0.12
Asian	6	7	-0.80*
Black	10	15	-4.98***
Latinx	52	45	7.05***
Native Hawaiian or Other Pacific Islander	2	2	0.06
White	24	24	-0.28
Multiracial	6	7	-0.94*

* Significant at $p < .05$; *** significant at $p < .001$.

Note: Population size = 19,336 students.

Source: Authors’ analysis of 2016/17 and 2017/18 Clark County School District student records data.

The study team computed unit response rates and item response rates, if applicable, for all key variables with missing records. The team conducted a nonresponse bias analysis and ultimately selected multiple imputation as the appropriate method to mitigate potential bias resulting from nonresponse. These steps are described in more detail in this appendix.

Response rates

The target population and original study sample included the population for this analysis: students in Clark County School District (CCSD) who were enrolled in the district in grade 5 in 2016/17 and were enrolled in CCSD in grade 6 in 2017/18. For all unit response rates the denominator was the total number of students in this population. Generally, the numerator for unit response rates would be the number of nonmissing records.

$$\frac{\text{Nonmissing records}}{\text{Total number of students in the target population}}$$

For the three key variables with missing records that were based on survey data, it was also necessary to calculate item response rates based on responses to specific items within the respondent population. The survey items were reflected in the combined score variables, which were key variables in the current analysis. The denominator was the total count of students for whom data was available for any of these key variables. The numerator for each variable was the number of students with data for the specific variable.

$$\frac{\text{Number of students with variable responses}}{\text{Total number of students with any survey variable data}}$$

For the test score variable, even though a combined average of the math and English language arts (ELA) scores were used in the analysis, the individual math and ELA scores were examined here. The item response rate denominator was the total number of students with any test score data, and the numerator was the number of students with subject-specific data, either ELA or math.

Table C2 reports unit and item response rates for all key variables.

Table C2. Unit and item response rates for key variables with missing data

Type of data collected	Number of students from whom attempt were made to collect data	Number of students with data	Response rate (percent)
Key variable: SBAC test score data			
Any data for SBAC test scores (unit response rate)	19,336	19,313	99.9
Responses for SBAC mathematics scores (item response rate)	19,313	19,292	99.9
Responses for SBAC ELA scores (item response rate)	19,313	19,309	99.9
Key variables: growth mindset, academic behavior, and performance avoidance survey scores (1–5 scale)			
Any data from the analysis survey variables (unit response rate)	19,336	12,790	66.1
Responses for the survey score on growth mindset (item response rate)	12,790	12,513	97.8
Responses for the survey score on academic behavior (item response rate)	12,790	12,489	97.6
Responses for the survey score on performance avoidance (item response rate)	12,790	12,512	97.8
All required variables for addressing the research question	19,336	11,986	62.0

SBAC is Smarter Balanced Assessment Consortium standardized state tests.
 Source: Authors’ analysis of 2016/17 and 2017/18 Clark County School District student records data.

Because the unit response rates for the survey score data were well below 85 percent, the study team conducted a nonresponse bias analysis to assess the possibility of bias associated with the missing data.

Nonresponse bias analysis

The nonresponse bias analysis attempted to understand the extent to which the data with complete responses might differ from the original study sample. The first step was to identify covariates that strongly related to the key variables with missing data for which there were no missing records. This enabled a comparison of covariate means in the original study sample and in the subset of records with complete data.

The selected covariates must be clearly related to the key variables with missing data and have complete data for all records in the original sample study (Graham, 2009). Based on these criteria, the identified covariates were student race/ethnicity, gender, English learner status, indicator of a grade point average (GPA) below 2.0, and school location.

For each of these covariates the average value was calculated for the original study sample and for the subset of records with complete data for the key variables with missing records. Tables C3–C6 report the results of these calculations along with the correlation coefficient for each key variable with missing data.

Table C3. Nonresponse bias analysis results for academic behavior scores

Covariate	Mean for students with academic behaviors data	Mean for original study sample	Difference ^a (standard deviation)	Correlation with academic behavior score ^b
Female (percent)	51	51 (1.01)	0.00	.14***
English learner (percent)	12	12 (0.37)	−0.01	−.11***
American Indian (percent)	0	0 (0.06)	0.01	−.01
Asian (percent)	6	6 (0.26)	0.02	.01
Black (percent)	10	12 (0.37)	0.05	−.01
Latinx (percent)	52	49 (0.98)	−0.05	−.05***
Native Hawaiian or Other Pacific Islander (percent)	2	2 (0.13)	0.00	.01
White (percent)	24	24 (0.56)	0.00	.07***
Multiracial (percent)	6	7 (0.27)	0.02	−.01
GPA < 2.0 (percent)	17	19 (0.49)	0.05	−.20***
School-level averages				
Average Female (percent)	51	51 (12.13)	−0.05	−.01
Average English learner (percent)	12	12 (1.36)	0.03	−.11***
Average American Indian (percent)	0	0 (0.98)	0.11	.01
Average Asian (percent)	6	6 (1.14)	0.04	.05***
Average Black (percent)	11	12 (1.63)	0.16	−.03*
Average Latinx (percent)	50	49 (2.17)	−0.05	−.11***
Average Native Hawaiian or Other Pacific Islander (percent)	2	2 (1.19)	−0.07	.03*

Covariate	Mean for students with academic behaviors data	Mean for original study sample	Difference ^a (standard deviation)	Correlation with academic behavior score ^b
Average White (percent)	25	24 (1.27)	-0.03	.11***
Average Multiracial (percent)	7	7 (1.88)	0.07	.09***
Average GPA < 2.0 (percent)	17	19 (1.72)	0.16	-.07***

* Significant at $p < .05$; *** significant at $p < .001$.

GPA is grade point average.

Note: Numbers in parentheses are the mean in standard deviation units.

a. Given that there are 65 schools in Clark County, and in the interest of brevity, only the average net difference in standard deviation units is reported here to provide an overall picture of how schools differ between respondent and original samples.

b. Pairwise correlation coefficients.

Source: Authors' analysis of 2016/17 and 2017/18 Clark County School District student records data.

Table C4. Nonresponse bias analysis results for performance avoidance scores

Covariate	Mean for students with performance avoidance data	Mean for original study sample	Difference (standard deviation) ^a	Correlation with performance avoidance score ^b
Female (percent)	51	51 (1.01)	-0.01	-.02*
English learner (percent)	12	12 (0.37)	-0.01	.23***
American Indian (percent)	0	0 (0.06)	0.01	-.01
Asian (percent)	6	6 (0.26)	0.02	-.01
Black (percent)	10	12 (0.37)	0.05	-.02*
Latinx (percent)	52	49 (0.98)	-0.05	.13***
Native Hawaiian or Other Pacific Islander (percent)	2	2 (0.13)	0.00	-.01
White (percent)	24	24 (0.56)	0.01	-.12***
Multiracial (percent)	6	7 (0.27)	0.01	-.02*
GAP < 2.0 (percent)	17	19 (0.49)	0.04	.24***
School-level averages				
Average Female (percent)	51	51 (12.13)	-0.08	.01
Average English learner (percent)	12	12 (1.36)	0.03	.14***
Average American Indian (percent)	0	0 (0.98)	0.15	-.02

Covariate	Mean for students with performance avoidance data	Mean for original study sample	Difference (standard deviation) ^a	Correlation with performance avoidance score ^b
Average Asian (percent)	6	6 (1.14)	0.03	-.05***
Average Black (percent)	11	12 (1.63)	0.13	.06***
Average Latinx (percent)	50	49 (2.17)	-0.04	.13***
Average Native Hawaiian or Other Pacific Islander (percent)	2	2 (1.19)	-0.09	-.03***
Average White (percent)	24	24 (1.27)	-0.02	-.14***
Average multiracial (percent)	7	7 (1.88)	0.05	-.11***
Average GPA < 2.0 (percent)	17	19 (1.72)	0.15	.10***

GPA is grade point average.

* Significant at $p < .05$; *** significant at $p < .001$.

Note: Numbers in parentheses are the mean in standard deviation units.

a. Given that there are 65 schools in Clark County, and in the interest of brevity, only the average net difference in standard deviation units is reported here to provide an overall picture of how schools differ between respondent and original samples.

b. Pairwise correlation coefficients.

Source: Authors' analysis of 2016/17 and 2017/18 Clark County School District student records data.

Table C5. Nonresponse bias analysis results for growth mindset scores

Covariate	Mean for students with growth mindset data	Mean for original study sample	Difference (standard deviation) ^a	Correlation with growth mindset score ^b
Female (percent)	51	51 (1.01)	0.00	.01
English learner (percent)	12	12 (0.37)	-0.01	-.25***
American Indian (percent)	0	0 (0.06)	0.00	-.01
Asian (percent)	6	6 (0.26)	0.02	.02*
Black (percent)	10	12 (0.37)	0.05	-.02*
Latinx (percent)	51	49 (0.98)	-0.05	-.14***
Native Hawaiian or Other Pacific Islander (percent)	2	2 (0.13)	0.00	.00
White (percent)	24	24 (0.56)	0.00	.14***
Multiracial (percent)	6	7 (0.27)	0.01	.04***

Covariate	Mean for students with growth mindset data	Mean for original study sample	Difference (standard deviation) ^a	Correlation with growth mindset score ^b
GAP < 2.0 (percent)	17	19 (0.49)	0.04	-.22***
School-level averages				
Average Female (percent)	51	51 (12.13)	-0.01	-.01
Average English learner (percent)	12	12 (1.36)	0.03	-.18***
Average American Indian (percent)	0	0 (0.98)	0.09	.01
Average Asian (percent)	6	6 (1.14)	0.03	.08***
Average Black (percent)	11	12 (1.63)	0.13	-.07***
Average Latinx (percent)	50	49 (2.17)	-0.04	-.17***
Average Native Hawaiian or Other Pacific Islander (percent)	2	2 (1.19)	-0.05	.04***
Average White (percent)	25	24 (1.27)	-0.02	.18***
Average Multiracial (percent)	7	7 (1.88)	0.05	.15***
Average GPA < 2.0 (percent)	17	19 (1.72)	0.15	-.13***

* Significant at $p < .05$; *** significant at $p < .001$.

GPA is grade point average.

Note: Numbers in parentheses are the mean in standard deviation units.

a. Given that there are 65 schools in Clark County, and in the interest of brevity, only the average net difference in standard deviation units is reported here to provide an overall picture of how schools differ between respondent and original samples.

b. Pairwise correlation coefficients.

Source: Authors' analysis of 2016/17 and 2017/18 Clark County School District student records data.

Table C6. Nonresponse bias analysis results for average Smarter Balanced Assessment Consortium (SBAC) test scores

Covariates (and units)	Mean for students with SBAC test data	Mean for original study sample	Difference (standard deviation) ^a	Correlation with SBAC test score ^b
Female (percent)	51	51 (1.01)	0.00	.04***
English learner (percent)	12	12 (0.37)	0.00	-.40***
American Indian (percent)	0	0 (0.06)	0.00	-.01*
Asian (percent)	6	6 (0.26)	0.00	.14***
Black (percent)	12	12 (0.37)	0.00	-.18***

Covariates (and units)	Mean for students with SBAC test data	Mean for original study sample	Difference (standard deviation) ^a	Correlation with SBAC test score ^b
Latinx (percent)	49	49 (0.98)	0.00	-.20***
Native Hawaiian or Other Pacific Islander (percent)	2	2 (0.13)	0.00	.02
White (percent)	24	24 (0.56)	0.00	.25***
Multiracial (percent)	7	7 (0.27)	0.00	.07***
GAP < 2.0 (percent)	19	19 (0.49)	0.00	-.47***
School-level averages				
Average Female (percent)	51	51 (12.13)	0.00	-.02*
Average English learner (percent)	12	12 (1.36)	0.00	-.31***
Average American Indian (percent)	0	0 (0.98)	0.00	.01
Average Asian (percent)	6	6 (1.14)	0.00	.18***
Average Black (percent)	12	12 (1.63)	0.00	-.18***
Average Latinx (percent)	49	49 (2.17)	0.00	-.30***
Average Native Hawaiian or Other Pacific Islander (percent)	2	2 (1.19)	0.00	.10***
Average White (percent)	24	24 (1.27)	0.00	.31***
Average Multiracial (percent)	7	7 (1.88)	0.01	.27***
Average GPA < 2.0 (percent)	19	19 (1.72)	0.00	-.24***

* Significant at $p < .05$; *** significant at $p < .001$.

GPA is grade point average.

Note: Numbers in parentheses are the mean in standard deviation units.

a. Given that there are 65 schools in Clark County, and in the interest of brevity, only the average net difference in standard deviation units is reported here to provide an overall picture of how schools differ between respondent and original samples.

b. Pairwise correlation coefficients.

Source: Authors' analysis of 2016/17 and 2017/18 Clark County School District student records data.

Multiple imputation to adjust for missing data

The nonresponse bias analysis indicated that all of the key variables with the most significant missing data (the survey variables) have at least 0.05 standard deviation difference in means for at least seven covariates (see tables C3–C5). Moreover, the unit response rate for these variables, at 66 percent, is well below 85 percent (see table C2). For the additional key variable with missing data, average Smarter Balanced Assessment Consortium (SBAC) scores, the difference in means is not high enough to be of concern, nor is the unit response rate or the item response rates below 85 percent.

Nonetheless, the survey variables required adjustment to mitigate the potential for nonresponse bias.¹ After reviewing available methods, the study team selected multiple imputation as the strongest approach for making this adjustment (Graham, 2009). Several benefits of multiple imputation recommend it over alternative approaches. Most important is its reliance on a range of possible imputed values rather than on any one specific value. In essence, this allows for the inclusion of some variation in potential imputed values that is lost in regression-based single imputation models (Graham, 2009).

In general, multiple imputation proceeds in two stages. In the first stage a model is specified based on all variables imputed and on identified auxiliary variables (Graham, 2009). The current study's auxiliary variables included indicators of a student's race/ethnicity, gender, English learner status, and school setting. These variables are all significantly correlated with at least one of the study's key variables which, the study team believes, decreases the potential bias in the imputation model.

The procedure chosen for this first stage was multivariate imputation with chained equations, also known as a fully conditional specification (FCS). This procedure was selected over the alternative of multivariate normal imputation primarily because it has the flexibility to accommodate different types of variables, in this case continuous variables with a restricted range. The approach estimates a model for each variable specific to its characteristics. The study's key variables are continuous within a truncated scale ranging from 1 to 5.² Within FCS analysis the study team chose to use predicted mean matching, which combines a standard linear regression with the nearest-neighbor imputation approach. In short, it uses the regression results to identify nearest neighbor values within the complete cases and randomly draws an imputed value from this set. The strength of this approach is that it combines the prediction with actual observed data to produce plausible imputation values. A recent simulation study found poor performance with only one nearest neighbor and generally recommended around 10 (Morris et al., 2014). In response to this caution, the study team specified 10 nearest neighbors in its multiple imputation FCS model.

Another important consideration was the number of imputed datasets that should be generated in this first stage. Although no specific number of imputations is required, Graham et al. (2007) note that statistical power drops with the level of missingness at low numbers of imputation values. In general, they recommend 20–40 values for a level of missingness between 30 percent and 50 percent. The current study's level of missingness is about 34 percent for the key survey variables and 38 percent overall, implying a larger number of values. Accordingly, the study model generated 35 imputed values on which the final imputed analysis draws.

Another consideration was that the study's primary model was a multilevel model, which Puma et al. (2009) note requires a complementary imputation procedure when used with imputed values. As recommended by Puma et al., the study team included as auxiliary variables school indicators to approximate the multilevel structure of the primary modeling.

Finally, the study team specified that its imputation model impute separately for students by racial/ethnic group to further account for how patterns of missingness may vary based on student race/ethnicity. Thus, in the first stage of the multiple imputation process, the team specified an FCS predictive mean matching model imputing for all key variables with missing data separately by race/ethnicity and controlling for the auxiliary variables student race/ethnicity, gender, English learner status, and school site location, generating 35 imputed values for use in the primary model. In the second stage of the multiple imputation process, the imputed values generated

¹ Imputation was also used for a key nonsurvey variable with missing data; average SBAC scores.

² Although no rigorous evidence justifies this particular method, a recent comparison between multivariate normal imputation and FCS found that each approach was generally less biased than complete-case analysis (or simply restricting the sample to only complete cases) and led to similar results (Lee & Carlin, 2010).

in the first stage were used to estimate the results of the primary model. Specifically, all imputed values were used to produce multiple model results, and then coefficients and standard errors were computed by applying combination rules (Rubin, 1987). In particular, a multilevel logit model was specified with school as the second-level variable.

To check the robustness of the multiple imputation, the study team conducted a complete case analysis for each of the study models. In every case the results produced with and those produced without imputation were very similar, suggesting that imputation was not adding bias to the estimates. Results for both models with and without imputation are in table C7.

Model 1 included only the academic mindsets and behaviors variables. Model 2 added individual average SBAC scores. All variables were standardized.

All models were multilevel logistic regression models, with students nested within schools, generating estimates of the relationships between student and school characteristics and the probability of having a GPA below 2.0 in the first semester of grade 6.

Table C7. Primary model results with and without multiple imputation (odds ratios)

Variable	Model 1		Model 2	
	Without multiple imputation	With multiple imputation	Without multiple imputation	With multiple imputation
Academic behavior score (standardized)	0.710*** (0.0183)	0.729*** (0.0171)	0.721*** (0.0207)	0.734*** (0.0191)
Performance avoidance score (standardized)	1.368*** (0.0414)	1.352*** (0.0367)	1.109** (0.0377)	1.103** (0.0331)
Growth mindset score (standardized)	0.724*** (0.0218)	0.731*** (0.0199)	0.986 (0.0342)	0.987 (0.0316)
Average SBAC scores (standardized)			0.178*** (0.00823)	0.189*** (0.00660)
Constant (fixed effects)	0.152*** (0.0150)	0.174*** (0.0173)	0.0835*** (0.00943)	0.0911*** (0.0101)
Constant (random effects)	0.711** (0.0765)	0.752** (0.0780)	0.787* (0.0857)	0.820 (0.0859)
Number of observations	12,015	19,336	11,986	19,336
Number of groups	63	63	63	63

* Significant at $p < .05$; ** significant at $p < .01$; *** significant at $p < .001$.

SBAC is Smarter Balanced Assessment Consortium standardized state tests.

Note: Numbers in parentheses are standard errors. An odds ratio of > 1 suggests a positive relationship, while an odds ratio of < 1 indicates a negative relationship.

Source: Authors' analysis of 2016/17 and 2017/18 Clark County School District student records data.

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Appendix D. Student group analysis

This appendix presents the full results of models for student groups based on sociodemographic characteristics, including all levels of performance. This includes Black, Latinx, and Asian and White students, as well as English learner students and non-English learner students. Also presented are the full results for the low-performing prior achievement subgroup including all students with test scores below the 25th percentile. Model 1 includes only the academic mindsets and behaviors variables; model 2 adds the individual average Smarter Balanced Assessment Consortium (SBAC) scores. All variables are standardized. All models are multilevel logistic regression models, with students nested within schools, generating estimates of the relationships between student and school characteristics and the probability of having a grade point average (GPA) below 2.0 in the first semester of grade 6.

Black students

Table D1. Full primary model regression results for Black students including all levels of achievement (odds ratios)

Variable	Model 1	Model 2
Academic behavior score (standardized)	0.793*** (0.0488)	0.782*** (0.0559)
Performance avoidance score (standardized)	1.361*** (0.0948)	1.124 (0.0873)
Growth mindset (standardized)	0.810*** (0.0504)	1.079 (0.0824)
Average SBAC scores (standardized)		0.165*** (0.0159)
Constant (fixed effects)	0.389*** (0.0402)	0.119*** (0.0167)
Random-effects parameter (standard deviation of the constant)	0.635** (0.0882)	0.729* (0.101)
Number of observations	2,297	2,297
Number of groups	59	59

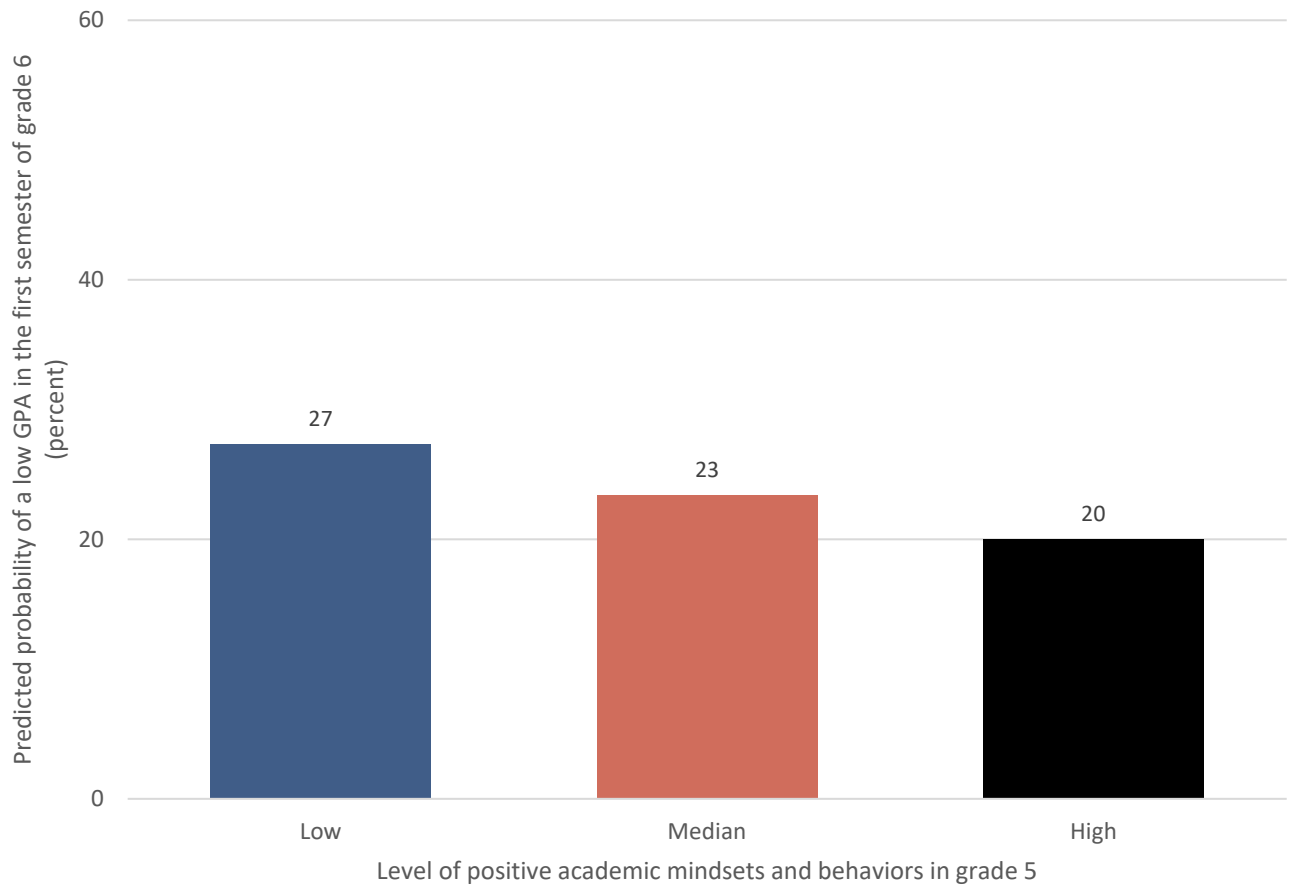
* Significant at $p < .05$; ** significant at $p < .01$; *** significant at $p < .001$.

SBAC is Smarter Balanced Assessment Consortium standardized state tests.

Note: Sample size = 19,336 students. Numbers in parentheses are standard errors. An odds ratio of > 1 suggests a positive relationship, while an odds ratio of < 1 indicates a negative relationship. Model 1 includes only the academic mindsets and behaviors variables; model 2 adds the individual average SBAC scores. The predicted mean matching method was used for imputation of missing values.

Source: Authors' calculation from 2016/17 and 2017/18 Clark County School District student records data.

Figure D1. Model 2 for Black students including all levels of achievement predicted a meaningful change in the probability of a low first-semester grade 6 grade point average as student positive mindsets and behaviors increased, holding individual test scores constant at the median



GPA is grade point average.

Note: Sample size = 2,297 students. Smarter Balanced Assessment Consortium (SBAC) test scores in grade 5 were held constant at the median. Prior academic achievement was defined as the average of grade 5 standardized SBAC scores in math and English language arts. The figure shows, for example, that Black students with a low level of positive academic mindsets and behaviors in grade 5 had a 27 percent probability of having a low GPA in the first semester of grade 6, while Black students with a high level of positive academic mindsets and behaviors in grade 5 had a 20 percent probability of having a low GPA in the first semester of grade 6. A low level of positive academic mindsets and behaviors indicates scoring at the 25th percentile of growth mindset and academic behaviors and at the 75th percentile of performance avoidance, a median level indicates scoring at the median on all three measures, and a high level indicates scoring at the 75th percentile of growth mindset and academic behaviors and the 25th percentile of performance avoidance. The *F*-statistic for a joint significance test of all behaviors and mindset variables was 6.06 ($p < .001$). Predictions were based on a multilevel logistic regression using student grade 5 reports of the level of academic behavior, growth mindset, and performance avoidance and SBAC scores to predict a dichotomous variable indicating whether a student had a first-semester grade 6 GPA below 2.0 at each positive academic behaviors and mindsets level, with SBAC scores held constant at the median within a given student group. The predicted mean matching method was used for imputation of missing values.

Source: Authors' calculation from 2016/17 and 2017/18 Clark County School District student records data.

Latinx students

Table D2. Full primary model regression results for Latinx students including all levels of achievement (odds ratios)

Variables	Model 1	Model 2
Academic behavior score (standardized)	0.745*** (0.0231)	0.755*** (0.0256)
Performance avoidance score (standardized)	1.390*** (0.0530)	1.148** (0.0497)
Growth mindset (standardized)	0.718*** (0.0258)	0.945 (0.0403)
Average SBAC scores (standardized)		0.204*** (0.00961)
Constant (fixed effects)	0.187*** (0.0171)	0.0932*** (0.0106)
Random-effects parameter (standard deviation of the constant)	0.634*** (0.0718)	0.780* (0.0857)
Number of observations	9,470	9,470
Number of groups	63	63

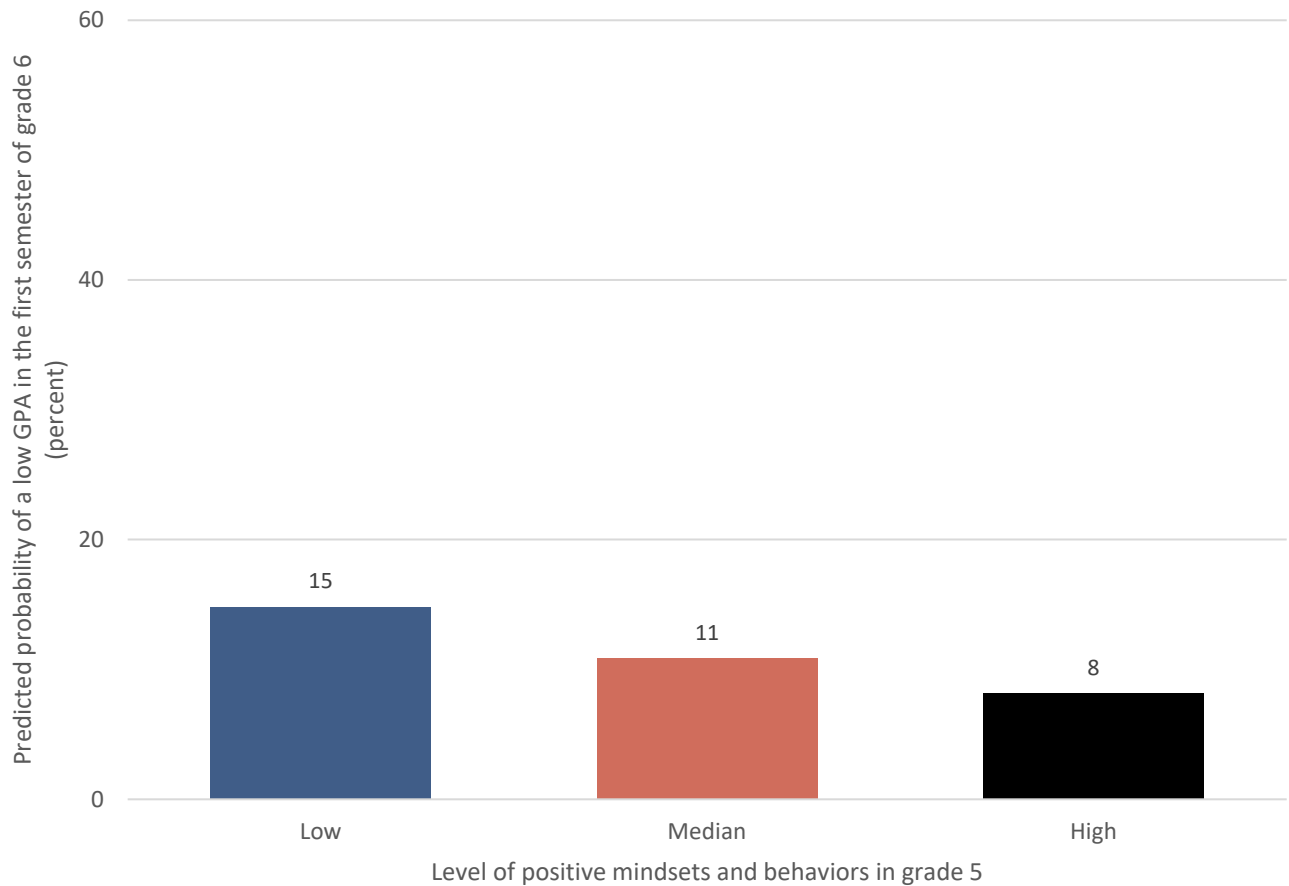
* Significant at $p < .05$; ** significant at $p < .01$; *** significant at $p < .001$.

SBAC is Smarter Balanced Assessment Consortium standardized state tests.

Note: Sample size = 19,336 students. Numbers in parentheses are standard errors. An odds ratio of > 1 suggests a positive relationship, while an odds ratio of < 1 indicates a negative relationship. Model 1 includes only the academic mindsets and behaviors variables; model 2 adds the individual average SBAC scores. The predicted mean matching method was used for imputation of missing values.

Source: Authors' calculation from 2016/17 and 2017/18 Clark County School District student records data.

Figure D2. Model 2 for Latinx students including all levels of achievement predicted a meaningful change in the probability of a low first-semester grade 6 grade point average as student positive mindsets and behaviors increased, holding individual test scores constant at the median



GPA is grade point average.

Note: Sample size = 9,470 students. Smarter Balanced Assessment Consortium (SBAC) test scores in grade 5 were held constant at the median. Prior academic achievement was defined as the average of grade 5 standardized SBAC scores in math and English language arts. The figure shows, for example, that Latinx students with a low level of positive academic mindsets and behaviors in grade 5 had a 15 percent probability of having a low GPA in the first semester of grade 6, while Latinx students with a high level of positive academic mindsets and behaviors in grade 5 had an 8 percent probability of having a low GPA in the first semester of grade 6. A low level of positive academic mindsets and behaviors indicates scoring at the 25th percentile of growth mindset and academic behaviors and at the 75th percentile of performance avoidance, a median level indicates scoring at the median on all three measures, and a high level indicates scoring at the 75th percentile of growth mindset and academic behaviors and the 25th percentile of performance avoidance. The *F*-statistic for a joint significance test of all behaviors and mindset variables was 35.57 ($p < .001$). Predictions were based on a multilevel logistic regression using student grade 5 reports of the level of academic behavior, growth mindset, and performance avoidance and SBAC scores to predict a dichotomous variable indicating whether a student had a first-semester grade 6 GPA below 2.0 at each positive academic behaviors and mindset level, with SBAC scores held constant at the median within a given student group. The predicted mean matching method was used for imputation of missing values.

Source: Authors' calculation from 2016/17 and 2017/18 Clark County School District student records data.

Asian and White students

Table D3. Full primary model regression results for Asian and White students including all levels of achievement (odds ratios)

Variables	Model 1	Model 2
Academic behavior score (standardized)	0.615*** (0.0397)	0.639*** (0.0429)
Performance avoidance score (standardized)	1.268** (0.0947)	0.991 (0.0832)
Growth mindset score (standardized)	0.703*** (0.0523)	0.931 (0.0784)
Average SBAC scores (standardized)		0.197*** (0.0154)
Constant (fixed effects)	0.106*** (0.0114)	0.0825*** (0.00984)
Random-effects parameter (standard deviation of the constant)	0.658** (0.0886)	0.709* (0.0999)
Number of observations	5,828	5,828
Number of groups	62	62

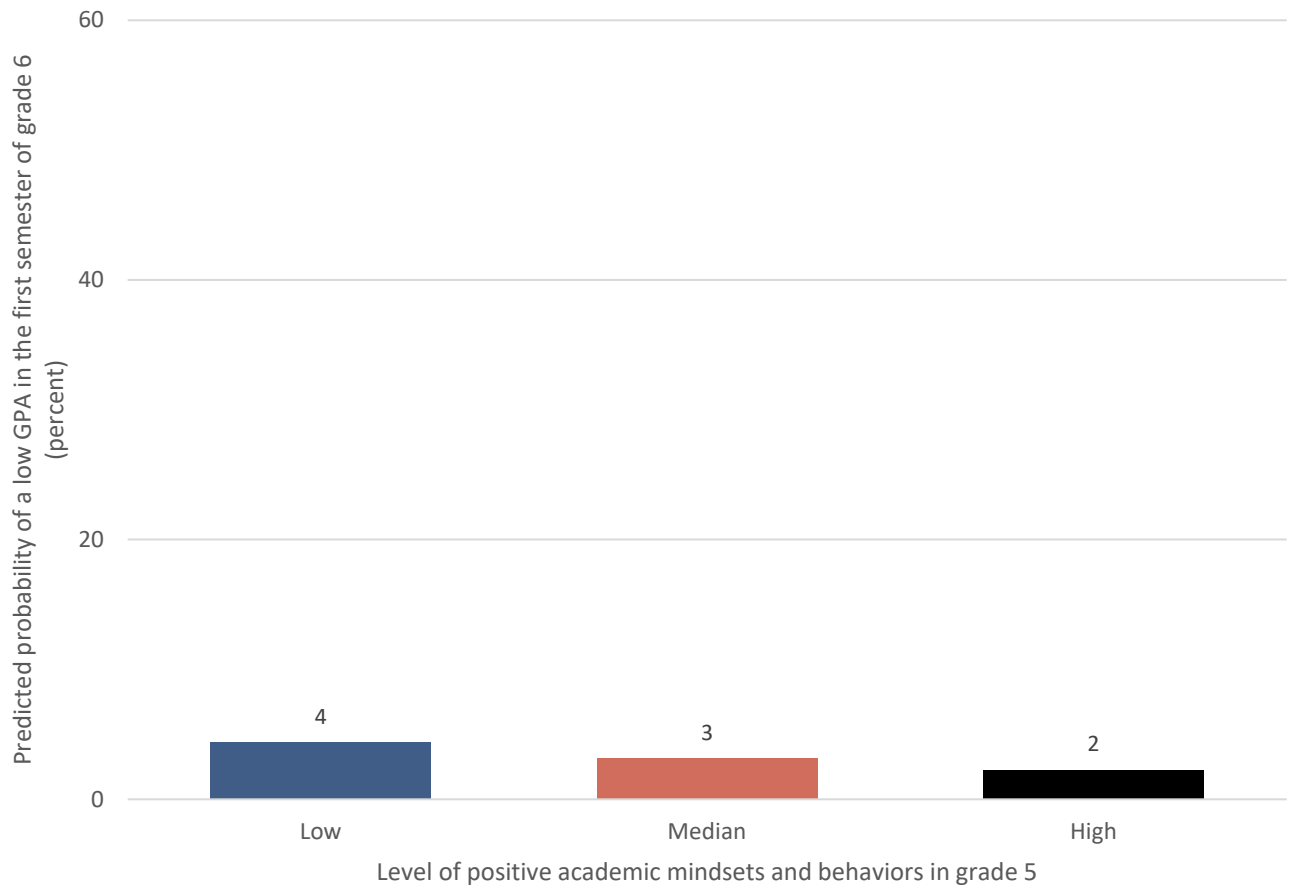
* Significant at $p < .05$; ** significant at $p < .01$; *** significant at $p < .001$.

SBAC is Smarter Balanced Assessment Consortium standardized state tests.

Note: Sample size = 19,336 students. Numbers in parentheses are standard errors. An odds ratio of > 1 suggests a positive relationship, while an odds ratio of < 1 indicates a negative relationship. Model 1 includes only the academic mindsets and behaviors variables; model 2 adds the individual average SBAC scores. The predicted mean matching method was used for imputation of missing values.

Source: Authors' calculation from 2016/17 and 2017/18 Clark County School District student records data.

Figure D3. Model 2 for Asian and White students including all levels of achievement did not predict a meaningful change in the probability of a low first-semester grade 6 grade point average as student positive mindsets and behaviors increased, with individual test scores held constant at the median



GPA is grade point average.

Note: Sample size = 5,828 students. Smarter Balanced Assessment Consortium (SBAC) test scores in grade 5 were held constant at the median. Prior academic achievement was defined as the average of grade 5 standardized SBAC scores in math and English language arts. The figure shows, for example, that Asian and White students with a low level of positive academic mindsets and behaviors in grade 5 had a 4 percent probability of having a low GPA in the first semester of grade 6, while Asian and White students with a high level of positive academic mindsets and behaviors in grade 5 had a 2 percent probability of having a low GPA in the first semester of grade 6. A low level of positive academic mindsets and behaviors indicates scoring at the 25th percentile of growth mindset and academic behaviors and at the 75th percentile of performance avoidance, a median level indicates scoring at the median on all three measures, and a high level indicates scoring at the 75th percentile of growth mindset and academic behaviors and the 25th percentile of performance avoidance. The *F*-statistic for a joint significance test of all behaviors and mindset variables was 16.54 ($p < .001$). Predictions were based on a multilevel logistic regression using student grade 5 reports of the level of academic behavior, growth mindset, and performance avoidance and SBAC scores to predict a dichotomous variable indicating whether a student had a first-semester grade 6 GPA below 2.0 at each positive academic behaviors and mindsets level, with SBAC scores held constant at the median within a given student group. The predicted mean matching method was used for imputation of missing values.

Source: Authors' calculation from 2016/17 and 2017/18 Clark County School District student records data.

English learner students

Table D4. Full primary model regression results for English learner students including all levels of achievement (odds ratios)

Variables	Model 1	Model 2
Academic behavior score (standardized)	0.801*** (0.0371)	0.811*** (0.0397)
Performance avoidance score (standardized)	1.202*** (0.0672)	1.104 (0.0674)
Growth mindset score (standardized)	0.854** (0.0510)	0.952 (0.0615)
Average SBAC scores (standardized)		0.244*** (0.0230)
Constant (fixed effects)	0.523*** (0.0617)	0.128*** (0.0208)
Random-effects parameter (standard deviation of the constant)	0.708** (0.0902)	0.799 (0.0989)
Number of observations	2,344	2,344
Number of groups	63	63

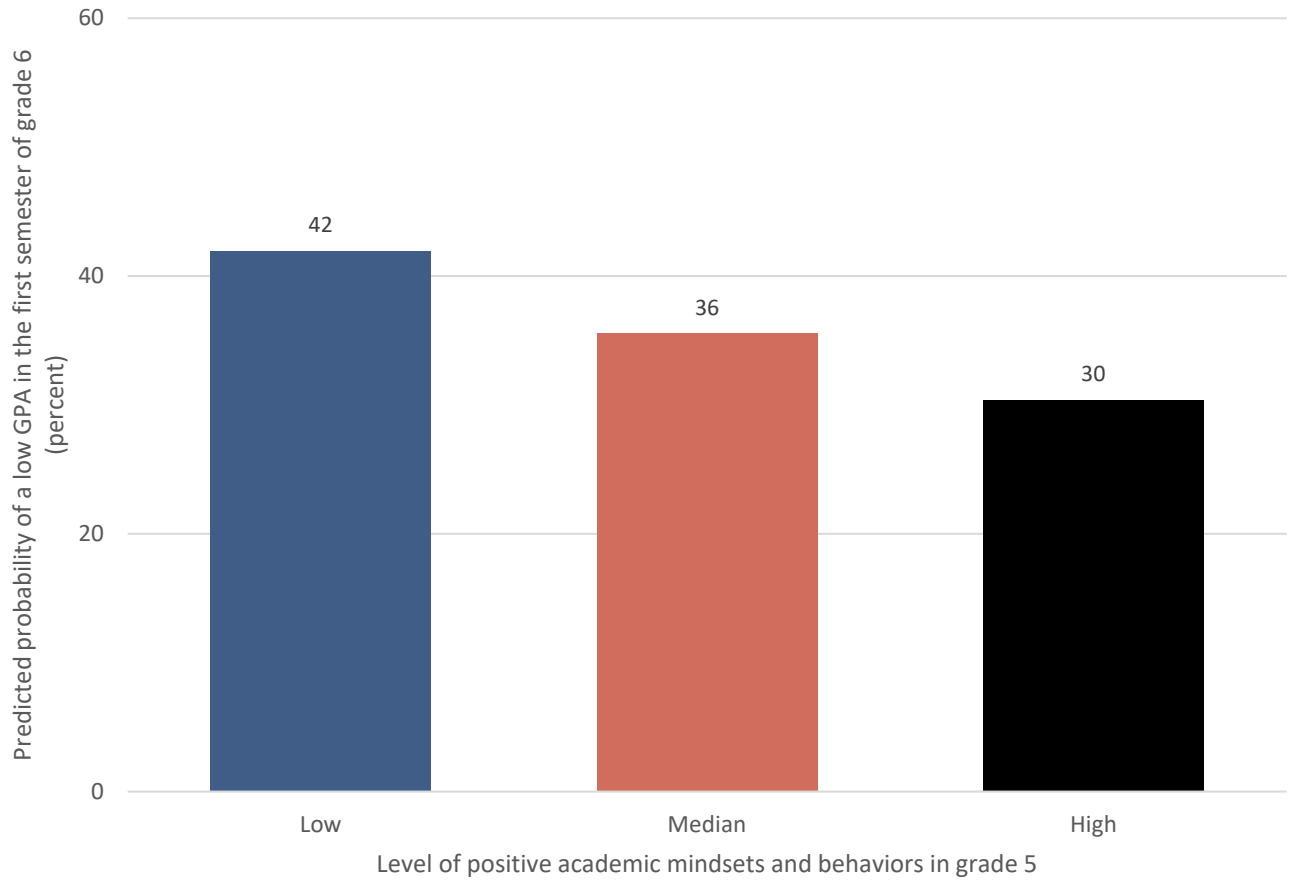
* Significant at $p < .05$; ** significant at $p < .01$; *** significant at $p < .001$.

SBAC is Smarter Balanced Assessment Consortium standardized state tests.

Note: Sample size = 19,336 students. Numbers in parentheses are standard errors. An odds ratio of > 1 suggests a positive relationship, while an odds ratio of < 1 indicates a negative relationship. Model 1 includes only the academic mindsets and behaviors variables; model 2 adds the individual average SBAC scores. The predicted mean matching method was used for imputation of missing values.

Source: Authors' calculation from 2016/17 and 2017/18 Clark County School District student records data.

Figure D4. Model 2 for English learner students including all levels of achievement predicted a meaningful change in the probability of a low first-semester grade 6 grade point average as student positive mindsets and behaviors increased, with individual test scores held constant at the median



GPA is grade point average.

Note: Sample size =2,344 students. Smarter Balanced Assessment Consortium (SBAC) test scores in grade 5 were held constant at the median. Prior academic achievement was defined as the average of grade 5 standardized SBAC scores in math and English language arts. The figure shows, for example, that English learner students with a low level of positive academic mindsets and behaviors in grade 5 had a 42 percent probability of having a low GPA in the first semester of grade 6, while English learner students with a high level of positive academic mindsets and behaviors in grade 5 had a 30 percent probability of having a low GPA in the first semester of grade 6. A low level of positive academic mindsets and behaviors indicates scoring at the 25th percentile of growth mindset and academic behaviors and at the 75th percentile of performance avoidance, a median level indicates scoring at the median on all three measures, and a high level indicates scoring at the 75th percentile of growth mindset and academic behaviors and the 25th percentile of performance avoidance. The *F*-statistic for a joint significance test of all behaviors and mindset variables was 8.83 ($p < .001$). Predictions were based on a multilevel logistic regression using student grade 5 reports of the level of academic behavior, growth mindset, and performance avoidance and SBAC scores to predict a dichotomous variable indicating whether a student had a first-semester grade 6 GPA below 2.0 at each positive academic behaviors and mindsets level, with SBAC scores held constant at the median within a given student group. The predicted mean matching method was used for imputation of missing values.

Source: Authors' calculation from 2016/17 and 2017/18 Clark County School District student records data.

Low-performing students

Table D5. Full primary model regression results for students below the 25th percentile in achievement including all sociodemographic groups (odds ratios)

Variables	Model 1	Model 2
Academic behavior score (standardized)	0.776*** (0.0273)	0.774*** (0.0283)
Performance avoidance score (standardized)	1.183*** (0.0492)	1.141** (0.0492)
Growth mindset score (standardized)	0.936 (0.0386)	0.998 (0.0436)
Average SBAC scores (standardized)		0.237*** (0.0210)
Constant (fixed effects)	0.735** (0.0790)	0.124*** (0.0195)
Random-effects parameter (standard deviation of the constant)	0.766* (0.0855)	0.817 (0.0903)
Number of observations	4,836	4,836
Number of groups	63	63

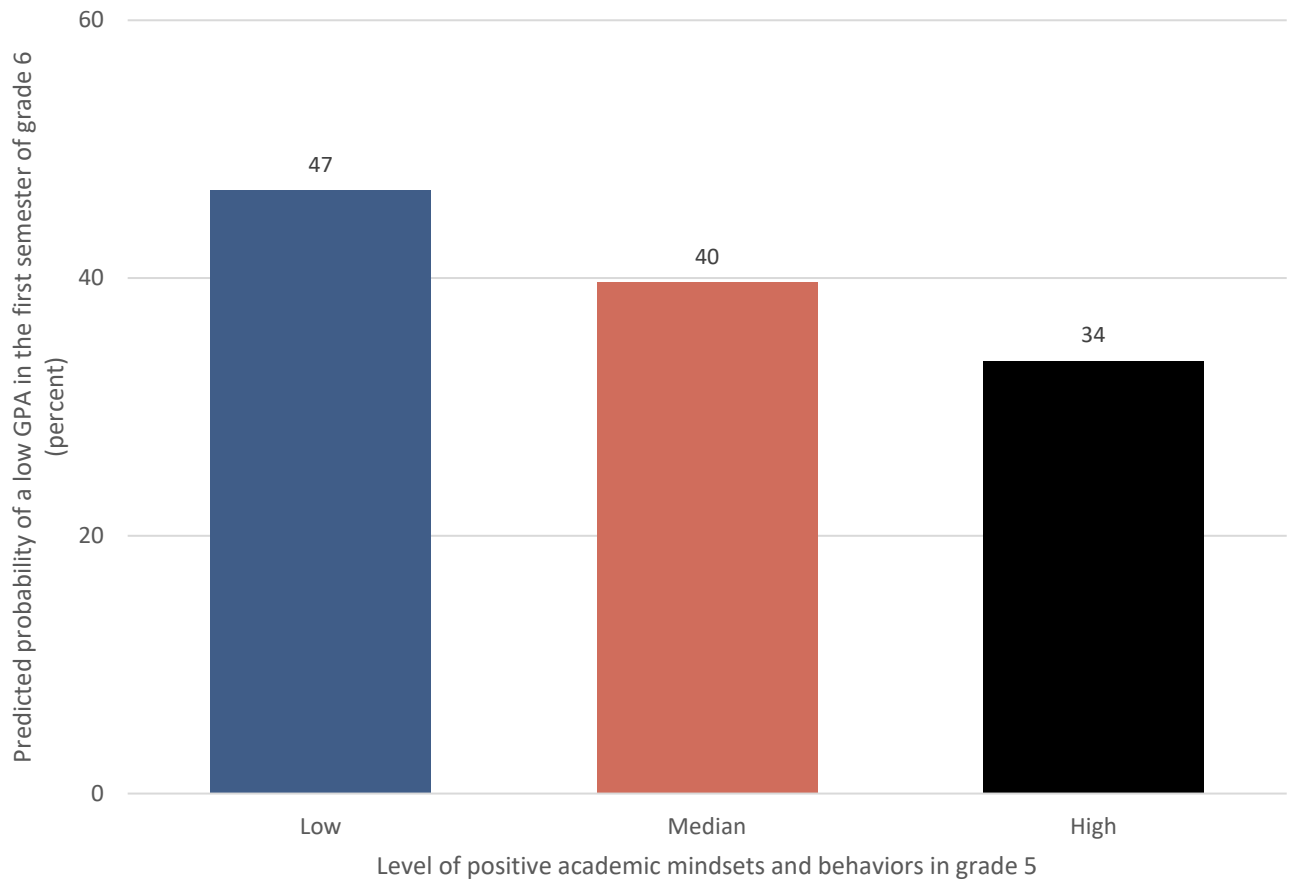
* Significant at $p < .05$; ** significant at $p < .01$; *** significant at $p < .001$.

SBAC is Smarter Balanced Assessment Consortium standardized state tests.

Note: Sample size = 19,336 students. Numbers in parentheses are standard errors. An odds ratio of > 1 suggests a positive relationship, while an odds ratio of < 1 indicates a negative relationship. Model 1 includes only the academic mindsets and behaviors variables; model 2 adds the individual average SBAC scores. The predicted mean matching method was used for imputation of missing values.

Source: Authors' calculation from 2016/17 and 2017/18 Clark County School District student records data.

Figure D5. Model 2 for low-performing students predicted a meaningful change in the probability of a low first-semester grade 6 grade point average as student positive mindsets and behaviors increased, with individual test scores held constant at the median



GPA is grade point average.

Note: Sample size = 4,836 students. Smarter Balanced Assessment Consortium (SBAC) test scores in grade 5 were held constant at the median. Prior academic achievement was defined as the average of grade 5 standardized SBAC scores in math and English language arts. The figure shows, for example, that low-performing students with a low level of positive academic mindsets and behaviors in grade 5 had a 47 percent probability of having a low GPA in the first semester of grade 6, while low-performing students with a high level of positive academic mindsets and behaviors in grade 5 had a 34 percent probability of having a low GPA in the first semester of grade 6. A low level of positive academic mindsets and behaviors indicates scoring at the 25th percentile of growth mindset and academic behaviors and at the 75th percentile of performance avoidance, a median level indicates scoring at the median on all three measures, and a high level indicates scoring at the 75th percentile of growth mindset and academic behaviors and the 25th percentile of performance avoidance. The *F*-statistic for a joint significance test of all behaviors and mindset variables was 24.73 ($p < .001$). Predictions were based on a multilevel logistic regression using student grade 5 reports of the level of academic behavior, growth mindset, and performance avoidance and SBAC scores to predict a dichotomous variable indicating whether a student had a first-semester grade 6 GPA below 2.0 at each positive academic behaviors and mindsets level, with SBAC scores held constant at the median within a given student group. The predicted mean matching method was used for imputation of missing values.

Source: Authors' calculation from 2016/17 and 2017/18 Clark County School District student records data.