# What Matters for Student Achievement? Exploring Teacher Instructional Practices and the Role of School-Level and Student-Level Characteristics

**August, 27, 2019**

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# Acknowledgments

The authors would like to acknowledge several people who contributed to and supported this report. At EL Education, Meg Riordan and Beth Miller provided advice and direction that greatly enhanced our ability to make this report usable. This report also would not have been possible without contributions from many other people at Mathematica. Emma Ernst and Kathryn Cronquist provided guidance on the data files. Sarah Dolfin and Phil Gleason provided critical technical review and feedback. Sharon Clark led the production of the report, which was edited by Jennifer Brown.

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# I.   INTRODUCTION

Rigorous state guidelines for student learning, such as the Common Core State Standards (CCSS), have sought to promote students' college and career readiness. With CCSS outlining the specific skills students need to meet these standards, it becomes paramount for policymakers, districts, and schools to understand what instructional practices teachers use in their classrooms to contribute to student learning. There is an important and growing body of literature that examines which general and subject-specific teacher instructional practices impact student academic outcomes. For example, teachers' general instructional practices, such as effective classroom time management, engaging students in class discussions, having structured lessons, asking thought-provoking questions, and promoting higher-order thinking skills have been shown to be positively related to achievement (Cohen and Hill 2000; Kane et al. 2011; Rowan et al. 2002; Scheerens and Bosker 1997; Wenglinsky 2002). The subject-specific practices teachers use can also facilitate students' learning and achievement in those content areas. In English language arts (ELA) classrooms, for example, teachers' emphasis on text analysis and the writing process can have a positive impact on students' growth in reading (Rowan et al. 2002).

Some studies also contend that school characteristics, such as class sizes, and student characteristics, such as socioeconomic status and race and ethnicity, are also important contextual factors for understanding what influences student achievement (Nye et al. 2000, 2004; Wenglinsky 2002, 2004). However, relatively less is known about how these characteristics might impact the way in which teachers' instructional practices are associated with student achievement. Conceptual frameworks of teacher effectiveness point to how the school context can impact both teacher instructional practices and student achievement (Scheerens and Blömeke 2016). This suggests that these contextual factors can also influence the extent to which teacher instructional practices and student achievement are related. Studies have explored the extent to which teacher effectiveness can vary by a function of school and student characteristics, but further research is needed in this area.

The purpose of this exploratory study is to contribute to this body of literature by providing evidence on how teaching practices might contribute to student learning in different ways for different groups of students or in different kinds of schools. Two overarching research questions guide the study:

- What instructional practices used by ELA teachers are related to higher levels of student achievement?

- To what extent are the relationships between teacher instructional practices and student achievement influenced by school-level and student-level characteristics?

This study details findings from the analysis of what and how ELA teachers' instructional practices relate to levels of student achievement. Given the exploratory nature of this study, we do not provide a priori hypotheses, and as a result, the study results should be interpreted with caution. Nevertheless, the findings presented in this study can suggest additional areas of inquiry

that require further examination to better understand the relationships between teacher instructional practices and student achievement.

In Chapter II, we describe the methods and analytic approach used for this study. In Chapter III, we present key findings from the analysis. In Chapter IV, we discuss the findings and offer some conclusions. We also include three appendices to support the discussion in the chapters. Appendix A provides more detailed descriptions of the instructional practices analyzed for this study, Appendix B presents descriptive characteristics of the sample used in the analysis, and Appendix C offers the full set of results for all analyses that were conducted.

# II.   METHODS AND ANALYTIC APPROACH

In this chapter we provide an overview of the study design and sample, the data measures and sources, and the analytic approach for examining our research questions.

## A.    Study design and sample

The data analyzed for this study come from a larger randomized controlled trial evaluating EL Education's Teacher Potential Project (TPP) funded by a five-year Investing in Innovation (i3) grant from the U.S. Department of Education (Dolfin et al. 2019). TPP was designed to foster the instructional capacity of ELA teachers in two ways: (1) through the implementation of a content-based ELA curriculum designed for grades 3 through 8 and aligned to the instructional demands of the CCSS and (2) through embedded professional development supports (for example, learning institutes, ongoing and personalized coaching, online supports) aligned to the curriculum. The TPP evaluation included 70 elementary and middle schools in 18 districts in urban, rural, and suburban locations in the United States. Two cohorts of schools were randomly assigned within each school district to the treatment or control conditions during the 2015–2016 and 2016–2017 school years. The evaluation estimated the impacts of TPP on teacher and student outcomes and found statistically significant positive impacts on teacher instructional practices after one year and positive impacts on student ELA test scores after two years (Choi et al. 2017, 2018; Dolfin et al. 2019).

Overall, this sample of schools was diverse in terms of socioeconomic status, race and ethnicity, and school and teacher faculty size. Among the students within the 70 schools participating in the evaluation, 48 percent were female and 71 percent were eligible for free or reduced-price lunch (Table II.1). Approximately 27 percent of the students were White non-Hispanic, 46 percent were Black non-Hispanic, 21 percent were Hispanic, and 6 percent reported another race. In the school year before participating in the TPP evaluation, the average student standardized ELA test score was –0.50 (where the average student standardized score among the norming population is zero), which suggests that the study schools had below-average student achievement. The average school enrolled 531 students and had 36 full-time teachers.

In this study, we used the data collected from 10,716 students taught by 214 ELA teachers in 63 schools that participated in their first year of the TPP evaluation (the 2015–2016 or 2016–2017 school years). We pooled the data from the treatment and control group samples and only used the sample of study teachers with nonmissing instructional practice data and whose students have nonmissing test score data (described in the next section).

**Table II.1. Characteristics of schools participating in the randomized controlled trial for the TPP evaluation**

| School characteristic | Overall mean (SD) |
|---|---|
| Charter school status (percentage) | 2.7 (0.16) |
| Students eligible for free or reduced-price lunch (percentage) | 70.6 (0.24) |
| Student race and ethnicity (percentage) | |
| White non-Hispanic | 27.2 (0.31) |
| Black non-Hispanic | 45.8 (0.34) |
| Hispanic | 20.7 (0.21) |
| Other race | 6.3 (0.07) |
| Female students (percentage) | 48.3 (0.03) |
| Number of students enrolled | 531.0 (207.39) |
| Number of full-time teachers | 35.8 (13.38) |
| Average student standardized ELA pretest score | –0.50 (0.45) |

Source: Dolfin et al. 2019.

## B. Data measures and sources

In this section we describe the data measures used for this analysis and their sources. These measures include teacher instructional practices, student achievement and student-level characteristics, and school-level characteristics.

### 1. Teacher instructional practices

Data on teachers' instructional practices were collected in two ways: through teacher surveys in which teachers self-reported the types of instructional practices they typically used in their classrooms, and through classroom observations that systematically captured information about teachers' practices. The survey and observation items captured both ELA instructional practices related to the CCSS and general teacher instructional practices. They took place during the fall and spring of schools' first year of participation in the study (the 2015–2016 school year for the first cohort of schools and 2016–2017 for the second cohort of schools).

Rather than examining individual items about teacher instructional practices from the survey or observation as outcomes, we built teacher practice constructs by combining several instructional practices that were similar to one another. For both instruments separately, we used the items to develop 31 constructs of teacher instructional practices. These constructs were based on a conceptual framework that identified 16 topics of practice nested within three main areas of instructional practices: general instruction, reading and writing instruction, and classroom management and environment. Within each topic, the study team conceptually identified teacher instructional practice constructs and used Bayesian confirmatory factor analysis with the collected classroom observation or survey items to finalize the construct development. A list of the topics and instructional practices within the three main areas is in Table II.2.

**Table II.2. Instructional topics and practices**

| Topic | Instructional practices |
|---|---|
| **General instruction area** | |
| Connected lesson | Connected lessons; stated learning purpose |
| Connections to world | Learning connected to personal experiences or real world |
| Content knowledge | Content knowledge development; demonstrate content knowledge and writing |
| Higher-order thinking | Assessment of higher-order thinking; higher-order thinking and reading; observed higher-order thinking |
| Multimedia use | Online writing; use of multimedia in instruction |
| Students' prior knowledge | Prior knowledge |
| Student independence | Student independence |
| Student participation | Collaborative discussion practices; student engagement in a class; student participation in discussion |
| Student responsibility for learning | Student responsibility for learning |
| **Reading and writing instruction area** | |
| Academic vocabulary | Academic vocabulary |
| Multiple types and purposes of writing | Engagement in multiple types of writing; writing for multiple purposes and audiences |
| Reading, writing, and/or speaking about the text | Close reading and writing that demonstrates understanding of text; reading, writing, and/or speaking about texts in the past two weeks; reading, writing, and/or speaking about texts in typical week |
| Use of text evidence | Assessment of text-evidence use; self-reported text-evidence use; use of text-evidence and argument writing |
| Writing conventions | Feedback on writing conventions; use of writing conventions |
| **Classroom management and environment area** | |
| Classroom climate | Positive classroom climate |
| Classroom management | Classroom disruptions (reversed so that higher values reflect infrequent disruptions); observed classroom management (behavioral); self-reported classroom management (values and rules) |

Source:    Dolfin et al. 2019.

The study team also developed a construct of overall ELA instructional practice, which combines each of the individual 31 constructs of teacher instructional practice into a single measure. Because teachers use a combination of practices in their classrooms, this measure is intended to represent how teachers holistically approach their teaching across the areas of general instruction, reading and writing instruction, and classroom management and environment.

The key outcomes at the focus of this analysis are the 31 individual instructional practices and the single overall summary measure. See Appendix A for more detailed descriptions of the constructs of teacher instructional practice organized by the three main topic areas and Dolfin et al. (2019) for more information on the analytic approach, model fit statistics, and calculation of the teacher instructional practice construct scores.

## 2.    Student achievement and student-level characteristics

The study team collected student administrative data from each district for students in grades 4 through 8 in the study schools participating in the TPP evaluation during their first year in the 2015–2016 or 2016–2017 school years. These data contained information on students' demographic and background characteristics, which included grade, gender, race and ethnicity,

free and reduced-price lunch (FRPL) eligibility, English learner status, and special education status. The study team also obtained students' end-of-year test scores on state-administered ELA and mathematics exams, along with the test scores from the previous school year as a pretest measure of student achievement. We then created standardized test scores based on a national norming population in order to make test scores comparable across the states (see Dolfin et al. 2019 for more information). These standardized scores represent how a given student performed relative to the average student in the same grade and subject in the state. The end-of-year standardized ELA test scores were used as the outcome measure in this analysis.

### 3.    School-level characteristics

The school-level characteristics used in this study were from the 2015–2016 or 2016–2017 school years and came from various sources. Schools' charter status, number of students, student demographics, number of full-time teachers, and student–teacher ratio were collected from the Common Core of Data. Schools' TPP status (that is, whether they received the intervention) was an artifact of their randomization outcome during the TPP evaluation, and information on teachers' novice status (defined as those with zero to three years of full-time teaching experience) was collected from districts and schools.

In addition, the data on student-level characteristics were used to develop two school-level characteristic measures. First, we aggregated information on students' FRPL eligibility provided by the districts to calculate the percentage of students at a given school who were eligible for FRPL. Second, we used the student race and ethnicity information (indicators for White non-Hispanic, Black non-Hispanic, Hispanic, and other race) provided by the districts to create a measure of school racial and ethnic diversity using the Simpson's Diversity Index (Simpson 1949). The Simpson's Diversity Index takes into account the number of groups and number of individuals within those groups to determine the diversity or uniformity of individuals within a particular setting. Scores range from 0 to 1, with 0 representing no diversity.

It is important to note that the study did not have access to classroom-level information. Although the study could link students to their respective teachers, we could not determine which particular students were together in a specific classroom for a given teacher. As a result, our discussion of the findings in Chapter III at times implicitly assumes that the school-level characteristics of the school are positively correlated with characteristics of the classroom.

## C.   Analytic approach

To address the first research question, we examined the relationship between each instructional practice and student achievement by estimating regressions of student achievement on a measure of the instructional practice, controlling for other school-level and student-level factors that might be associated with student achievement:

**Regression Model 1:**

$$Y_{sti} = \beta_0 + \beta_1 P_{st} + \beta_2 X_{sti} + \beta_3 W_s + v_{sti} \qquad (1),$$

where the following applies:

- $Y$ is the standardized ELA test score for student $i$ with teacher $t$ and in school $s$.

- $P$ is a given instructional practice for teacher $t$ in school $s$. Thirty-one measures of teacher instructional practices spanned 16 topics within the instructional areas of general instruction, reading and writing instruction, and classroom management and environment, and the overall ELA instructional practice measure (that combines each of the individual 31 constructs of teacher instructional practice into a single measure), were included in the analysis. We included only one instructional practice at a time in each regression and estimated a total of 32 regression models.

- $X$ is a vector of student-level characteristics for student $i$ with teacher $t$ in school $s$. The student-level characteristics included in the analyses were gender, race and ethnicity indicators (White non-Hispanic, Black non-Hispanic, Hispanic, and other race), FRPL eligibility, English learner status, special education status, standardized ELA pretest score, and standardized mathematics pretest score.

- $W$ is a vector of school-level characteristics for school $s$. The school-level characteristics included in the analyses were charter status, total number of students, number of full-time teachers, student–teacher ratio, TPP status (treatment = 1 or control = 0), teacher novice status, percentage of students eligible for FRPL, and racial and ethnic diversity.

- $v_{sti}$ is a composite error.

- $\beta_0$ is an intercept, and the estimates of $\beta_1, \beta_2$, and $\beta_3$ are slopes of the effects that capture the size, direction, and statistical significance of the association between corresponding predictors and an outcome. In this step, the $\beta_1$ coefficient is of most interest because it captures the association between a given instructional practice and the average standardized ELA test scores of a teacher's students.

In all regression analyses described below, we controlled for students' clustering within schools by estimating Huber-White robust standard errors. Some students did not have ELA test score data, and thus we excluded them from the analysis. We used nonresponse weights (inversely proportional to the probability of having a nonmissing outcome) to adjust for the nonresponse. Missing values of covariates (including pretest scores) were set to a single value (0 for binary variables and the sample mean for continuous variables), and indicators for missing values of covariates were included as controls in the regression. Table B.1 in Appendix B provides the descriptive statistics for the covariates included in the analysis.

To address the second research question, we defined a set of variables that might influence the effectiveness of each practice and examine how they influence the relationship between practices

and student achievement. These variables, called moderators, include factors at the school level as well as at the student level. The school-level factors are student–teacher ratio, total number of students, racial and ethnic diversity, and TPP status. The student-level factors are race and ethnicity (White non-Hispanic, Black non-Hispanic, and Hispanic) and FRPL eligibility.

To examine how each of these moderators influences the relationship between each practice and student achievement, to each regression model above we added an interaction term between the teacher instructional practice and a single moderator. Because a non-significant overall effect of instructional practice on students' outcomes could mask important variation by school-level or student-level predictors, we estimated interaction effects regardless of whether the main effect in Regression Model 1 was significant. In Regression Model 2, we added four moderating school-level variables and in Regression Model 3, we added four moderating student-level variables, one at a time, to each of the regressions estimated with Regression Model 1:[1]

**Regression Models 2 and 3:**

$$Y_{sti} = \beta_0 + \beta_1 P_{st} + \beta_2 X_{sti} + \beta_3 W_s + \beta_4 W_s^K * P_{st} + v_{sti} \qquad (2),$$

$$Y_{sti} = \beta_0 + \beta_1 P_{st} + \beta_2 X_{sti} + \beta_3 W_s + \beta_4 X_{sti}^K * P_{st} + v_{sti} \qquad (3),$$

where the following applies:

- $W_s^K$ and $X_{sti}^K$ represent, respectively, a school-level or student-level moderator $K$ from the list of school-level predictors (student–teacher ratio, total number of students, racial and ethnic diversity, and TPP status where treatment = 1 or control = 0) or from the list of student-level predictors (White non-Hispanic, Black non-Hispanic, Hispanic, and FRPL eligibility).

- $W * P$ and $X * P$ are the interaction effects that allow, respectively, a school-level moderator $W$ or student-level moderator $X$ to affect the strength and direction of the association between the instructional practice $P$ and students' ELA achievement.

- $\beta_4$ is the slope of the interaction effect that captures the size, direction, and statistical significance of the moderation effect.

The slope of the moderator effect $\beta_4$ shows whether, on average, the relationship between the instructional practice and student achievement depends on the levels of a school-level or student-level moderator. Positive interaction effect means that the effect of instructional practices is more positive with the higher values on a school-level moderator. Conversely, if the effect is negative, then the effect of a teacher instructional practice is more negative with higher values of a school-level moderator (or the other way around).

However, if the moderator has a significant effect on average, we still might want to learn whether the relationship between the instructional practice and student achievement is significant

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[1] We used the Benjamini-Hochberg method to adjust for multiple comparisons using the 0.05 value as a false discovery rate.

at different values of the moderator. For example, teachers' use of collaborative discussion practices might be beneficial for student achievement in the context of lower student–teacher ratios, where teachers have a greater chance of engaging students in discussion than in classrooms with higher student–teacher ratios. Thus, to better understand the effects of the moderator, we interpreted statistically significant interaction effects by using the approach proposed by Aiken and West (1991). In this approach, we tested the association between a teacher instructional practice and ELA achievement for different levels of the school-level or student-level moderator *and* teacher instructional practice (specifically, the mean and one standard deviation above and below the mean) by calculating separate regression lines for the different levels of the moderator. This enabled us to establish whether the effects of a teacher instructional practice remain significant for different values of a moderator.

# III. FINDINGS

This chapter presents the results from our analyses of the relationships between teachers' instructional practices and student achievement and whether these relationships vary by school-level and student-level characteristics. We also provide possible explanations for the discussed findings, which we hope will foster further research. The chapter focuses on findings with statistically significant relationships, with the full set of results presented in Tables C.1 and C.2 in Appendix C.

## A.    Relationships between teacher instructional practices and student achievement

The analyses consisted of running Regression Model 1 for each of the 31 instructional practices and the overall summary measure for ELA instructional practice. Of the 32 instructional practice measures examined, 6 practices in the general instruction or classroom management areas were significantly related to student achievement, whereas all the instructional practices in the reading and writing instruction area were not.

Table III.1 summarizes the statistically significant estimates of Regression Model 1 and the teacher instructional practices that are associated with student achievement.  Several instructional practices in the general instruction and classroom management and environment areas were related to higher student achievement after controlling for student-level and school-level characteristics.

More collaborative discussion practices, student engagement in class, a positive classroom climate, and student participation in discussions were positively related to higher student achievement. Prior research has found that classrooms' emotional climate is related to students' engagement and student performance in ELA classrooms (Reyes et al. 2012). The findings from this analysis also indicate that the social dynamics teachers foster in their classrooms, such as the climate they help create and how they engage their students, might play an important role in enhancing student achievement.

Teachers connecting learning to students' personal experiences or the real world was negatively associated with higher student achievement. Although making real-world connections to students' learning can help foster student interest and engagement in a topic (Guthrie and Davis 2003), teachers who are overly doing so might be reducing the amount of instructional time in the class period for other activities. Overuse of the instructional practice might also lessen its impact on deepening student interest in or understanding of a topic, especially if teachers miscalculate the personal experiences or real world examples that students would find relevant. The finding could also indicate that teachers more often rely on making real-world connections when they have less content knowledge in that topic or when working with lower-achieving students who are struggling to understand material, but further exploration is needed to better understand when and how often teachers decide to connect students' learning to students' personal experiences or the real world.

In the area of classroom management and environment, fewer reports of classroom disruptions were associated with higher student achievement, while increases in teachers' management of their students' behavior in their classroom (for example, enforcing behavioral rules or redirecting student disruptions) were related to lower student achievement levels. Fewer classroom disruptions allow teachers and students to stay more on task within the class period; if teachers need to spend more time actively managing their students' behaviors, this might reduce the amount of time available for instruction (Gettinger and Seibert 2002; Stronge et al. 2011). One possible explanation is that teachers who score higher on this measure also spend more time during the class period establishing and reinforcing behavior rules and less on direct instruction. Another explanation could be that classroom management that effectively promotes students' taking charge of their own behavior (and therefore not needing as much teacher-led management) also increases students' investment in their own learning and academic performance.

**Table III.1. Summary of regression analysis of student achievement on teacher instructional practices**

| Teacher instructional practice | Estimated coefficient | Standard error | p-value | Analytic sample size |
|---|---|---|---|---|
| **General instruction area** | | | | |
| Learning connected to personal experiences or real world | -0.177** | (0.07) | 0.01 | 9,234 |
| Student engagement in class | 0.223** | (0.06) | <0.01[b] | 9,234 |
| Student participation in discussion | 0.153* | (0.06) | 0.01 | 9,234 |
| **Classroom management and environment area** | | | | |
| Classroom climate | 0.290** | (0.07) | <0.01[b] | 9,234 |
| Classroom disruption (reversed)[a] | 0.153** | (0.05) | 0.01 | 10,610 |
| Observed classroom management | -0.188** | (0.07) | 0.01 | 9,234 |

Note:    A separate regression analysis was performed for each teacher instructional practice. Each analysis included the following student-level controls: standardized ELA pretest score, standardized mathematics pretest score, race (White non-Hispanic, Black non-Hispanic, and Hispanic), FRPL eligibility, gender, special education status, and English learner status; the following school-level controls: TPP status, racial and ethnic diversity, student–teacher ratio, total number of students, charter status, number of full-time teachers, and percentage of students eligible for FRPL; as well as teacher novice status. Standard errors are clustered at the school level.

[a]Construct was reverse coded so that higher values indicate fewer occurrences of student disruptions.

[b]After adjusting for multiple comparisons using the Benjamini-Hochberg correction, the relationship between the instructional practice and student achievement remained statistically significant at the 5 percent level.

*Statistically significant at the 5 percent level, two-tailed test.

**Statistically significant at the 1 percent level, two-tailed test.

Other examined instructional practices in the general instruction and classroom management and environment areas did not have a statistically significant relationship with student achievement. All the instructional practices in the reading and writing instruction area, along with the overall measure of ELA teachers' instructional practices, were not significantly related to their students' ELA achievement, on average. However, these average relationships between instructional practices and student achievement could be masking variations that exist for schools and students

with certain characteristics (for example, some instructional practices might be effective in some contexts but not others). This possibility motivates the next step in the analysis.

## B.  Moderators of the relationships between teacher instructional practices and student achievement

This section summarizes the results of Regression Models 2 and 3 and whether particular student-level and school-level characteristics moderate the association between teachers' instructional practices and student achievement. The analyses consisted of running regressions for each of the examined 32 instructional practice measures with each of the eight school-level or student-level factors that were tested as potential moderators. This resulted in a total of 256 regression models. Of these, 20 of the regression models produced a moderator that was statistically significant at the 5 percent level or better (Table III.2). The moderators that were statistically significant were predominantly school-level characteristics (for example, racial and ethnic diversity, student–teacher ratio, total number of students, and TPP status), and there was little evidence that the student-level characteristics moderated the relationship between teachers' instructional practices and student achievement.

**Table III.2. The number of teacher instructional practices moderated by school-level and student-level characteristics**

| School-level/student-level characteristic | Number of statistically significant moderated teacher practices |
|---|---|
| **School-level characteristics** | |
| School-level racial and ethnic diversity | 5 out of 32 |
| Student–teacher ratio | 5 out of 32 |
| Total number of students | 4 out of 32 |
| TPP status | 2 out of 32 |
| **Student-level characteristics** | |
| White non-Hispanic | 2 out of 32 |
| Black non-Hispanic | 1 out of 32 |
| Hispanic | 0 out of 32 |
| FRPL eligibility | 1 out of 32 |
| **Total** | **20 out of 256** |

We present findings with statistically significant interactive effects in Table III.3. Within the table, the estimated coefficients for the interaction between teacher instructional practices and the moderator variables provide information on how the combination of a specific instruction practice and moderator influence each other in their relationship with student achievement. For example, a positive coefficient indicates that as levels of the moderator increases, the magnitude of the relationship between the teacher instructional practice and student achievement also increases. We demonstrate this in the last three columns of the table by showing how the direction and magnitude of the relationship between the teacher instructional practice and student achievement would vary at different specified levels of the moderator (when the moderator is one standard deviation below, at, or one standard deviation about the mean). For ease of

discussion, when the moderator is at one standard deviation below the mean, we refer to this as "lower" levels of the moderator; "higher" levels correspond to one standard deviation above the mean. The table also shows cases in which the relationship between the practice and achievement is significantly different from zero for a given level of the moderator.

**Table III.3. Summary of regression analysis of moderators of relationship between teacher instructional practices and student achievement**

| Moderating variable | Teacher instructional practice | Estimated teacher practice-moderating variable interaction coefficient | Estimated teacher practice coefficient when moderator is:[a] | | |
|---|---|---|---|---|---|
| **School-level characteristics** | | | **-1 SD** | **Average** | **+1 SD** |
| School-level racial and ethnic diversity | Assessment of higher-order thinking | 0.672* | -0.118 | 0.023 | 0.163 |
| | Higher-order thinking and reading | 0.637* | **-0.145*** | -0.011 | 0.122 |
| | Feedback on writing conventions | 0.612* | -0.083 | 0.045 | 0.173 |
| | Reading, writing, and/or speaking about texts in past two weeks | 1.258** | -0.187 | 0.076 | **0.339*** |
| | Overall ELA instructional practices | 0.050* | -0.004 | 0.006 | 0.017 |
| Student–teacher ratio | Connected lessons | 0.059* | -0.003 | **0.232*** | **0.467*** |
| | Assessment of use of text evidence | 0.060** | -0.162 | 0.074 | **0.127*** |
| | Self-reported use of text evidence | 0.047* | -0.086 | 0.101 | **0.288*** |
| | Use of multimedia in instruction | -0.058** | **0.309*** | 0.075 | **-0.159*** |
| | Use of writing conventions | -0.057* | 0.257 | 0.027 | -0.203 |
| Total number of students | Connected lessons | 0.001* | -0.009 | **0.188*** | **0.385*** |
| | Collaborative discussion practices | -0.001* | **0.368*** | 0.137 | -0.095 |
| | Online writing | -0.001* | 0.104 | -0.052 | **-0.207*** |
| | Self-reported use of text evidence | 0.001* | -0.108 | 0.096 | 0.299 |
| **School-level characteristics** | | | **No** | | **Yes** |
| TPP treatment status | Content knowledge development | 0.296** | **-0.155*** | | 0.140 |
| | Writing for multiple purposes and audiences | -0.265* | **0.218*** | | -0.047 |
| **Student-level characteristics** | | | **No** | | **Yes** |
| White non-Hispanic | Stated learning purpose | -0.120* | 0.042 | | -0.077 |
| | Connected lessons | -0.281* | **0.218*** | | -0.047 |
| Black non-Hispanic | Self-reported classroom management | 0.342* | 0.047 | | **0.388*** |
| FRPL eligibility | Use of writing conventions | -0.279** | **0.243*** | | -0.036 |

Note:    A separate regression analysis was performed for each teacher instructional practice. Each analysis included the following student-level controls: standardized ELA pretest score, standardized mathematics pretest score, race (White non-Hispanic, Black non-Hispanic, and Hispanic), FRPL eligibility, gender, special education status, and English learner status; the following school-level controls: TPP status, racial and ethnic diversity, student–teacher ratio, total number of students, charter status, number of full-time teachers, and percentage of students eligible for FRPL; as well as teacher novice status. Standard errors are clustered at the school level.

[a]All relationships between the instructional practice and student achievement remained statistically significant after adjusting for multiple comparisons using the Benjamini-Hochberg correction.
*Statistically significant at the 5 percent level, two-tailed test.
**Statistically significant at the 1 percent level, two-tailed test.

We also present figures that graphically show information displayed in the last three columns of Table III.3 (Figures III.1–III.6. These figures depict how the direction and magnitude of the relationships between a teacher instructional practice and student achievement vary at different levels of the moderating variable (for example, at different levels of student–teacher ratios). A solid line indicates that the relationship is statistically significant, whereas a dotted line denotes a non-significant relationship.

## 1.    School-level characteristics

When the relationships between teacher instructional practices and student achievement were moderated, they tended to occur with school-level characteristics, as shown in Table III.3. The school-level characteristics that had a moderating effect are discussed in detail below.

### a.    School racial and ethnic diversity

Generally, as a school's racial and ethnic diversity increased, the relationships between student achievement and various general and reading and writing instructional practices became relatively more positive.[2] As shown by the positive, statistically significant estimated coefficients for the interaction between teacher instructional practices and the moderator variables in Table III.3, schools with higher levels of school racial and ethnic diversity demonstrated a more positive relationship between student achievement and (1) assessment of higher-order thinking; (2) higher-order thinking and reading; (3) feedback on writing conventions; (4) reading, writing, and/or speaking about texts in past two weeks; and (5) overall ELA instructional practices.

When testing these instructional practices at different levels of the racial and ethnic diversity moderator, we found a statistically significant negative relationship between higher-order thinking and reading and student achievement in schools with lower diversity (that is, when school diversity was one standard deviation below the mean) (see Figure III.1). Based on studies with college students, researchers have argued that students' diversity experiences foster their engagement in considering multiple perspectives and comparing and contrasting different points of view, which are aspects of students' higher-order thinking (Laird 2005). In relatively less racially and ethnically diverse schools, teachers might need to devote more time to higher-order thinking development or do so in ways that are not as effective as when teaching in more racially and ethnically diverse schools. Further exploration is needed to better understand the relationship between diversity, higher-order thinking, and student achievement, especially among younger students.

There was also a statistically significant positive relationship between reading, writing, and/or speaking about texts in the past two weeks and student achievement when school diversity was higher (that is, when school diversity was one standard deviation above the mean). Prior research has argued that culturally responsive teaching includes using collaborative teaching techniques, such as having students discuss together what they have just read (Aceves and Orosco 2014), and the findings in this study suggest that the greater use of this practice in the context of racially and

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[2] In this sample, the average school's racial and ethnic diversity was 0.40, with a standard deviation of 0.23 (see Appendix Table B.1). Scores on the Simpson's Diversity Index range from 0 to 1, with 0 representing no diversity and 1 representing complete diversity.

ethnically diverse schools can have beneficial outcomes for student achievement. For example, students might experience richer class discussions when they have peers of more diverse backgrounds and experiences in their school. Studies have also found that cooperative learning, when students work together in groups to complete assignments or tasks, can be an effective instructional practice in diverse classrooms (Hawley 2007), and students reading, writing, and speaking about texts together could be an example of one of those practices.

**Figure III.1. School-level racial and ethnic diversity moderating the relationships between teacher instructional practices and student achievement**
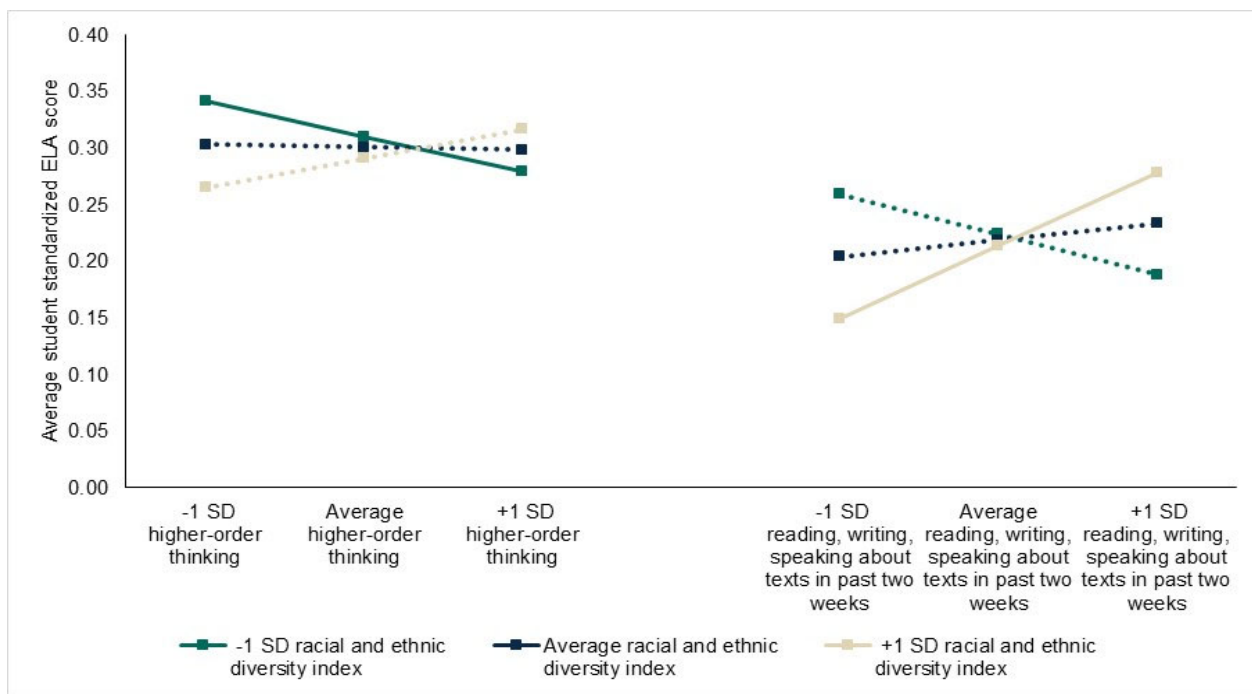


Note: Solid lines indicate a statistical significance at the 5 percent level, two-tailed test.

### b.   Student–teacher ratio

When schools' student–teacher ratios were higher, teachers' use of connected lessons had a statistically significant positive association with student achievement (Table III.3, Figure III.2).[3] Having cohesive lessons in which students know how topics are connected and where the instruction is going next can facilitate their acquisition of what is being taught and improve student achievement (Schacter and Thum 2004). In larger class sizes, having connected lessons might be of greater importance because teachers might be less able to provide individualized guidance to each student to make sure he or she is following the flow of the instruction.

The frequency and importance of students' use of text evidence also had a statistically significant positive association with student achievement when schools' student–teacher ratios were higher (see Figure III.3). Teachers with larger class sizes might more often ask students to cite text

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[3] In this sample, the average student-teacher ratio was 15.2, with a standard deviation of 3.47 (see Appendix Table B.1).

evidence to help monitor whether students are engaging with the texts they are asked to read, but this possible explanation and other hypotheses that can explain this finding require additional research.

The use of multimedia in instruction had a statistically significant positive relationship with student achievement when student–teacher ratios were higher but had a statistically significant negative relationship with student achievement when student–teacher ratios were lower. This could mean that smaller classroom settings are more conducive to switching across various multimedia tools for instruction, whereas in larger class sizes, transitioning across these different tools might take more time, which reduces the overall amount of instructional time on task.

**Figure III.2. School-level student–teacher ratio moderating the relationships between teacher instructional practices and student achievement**
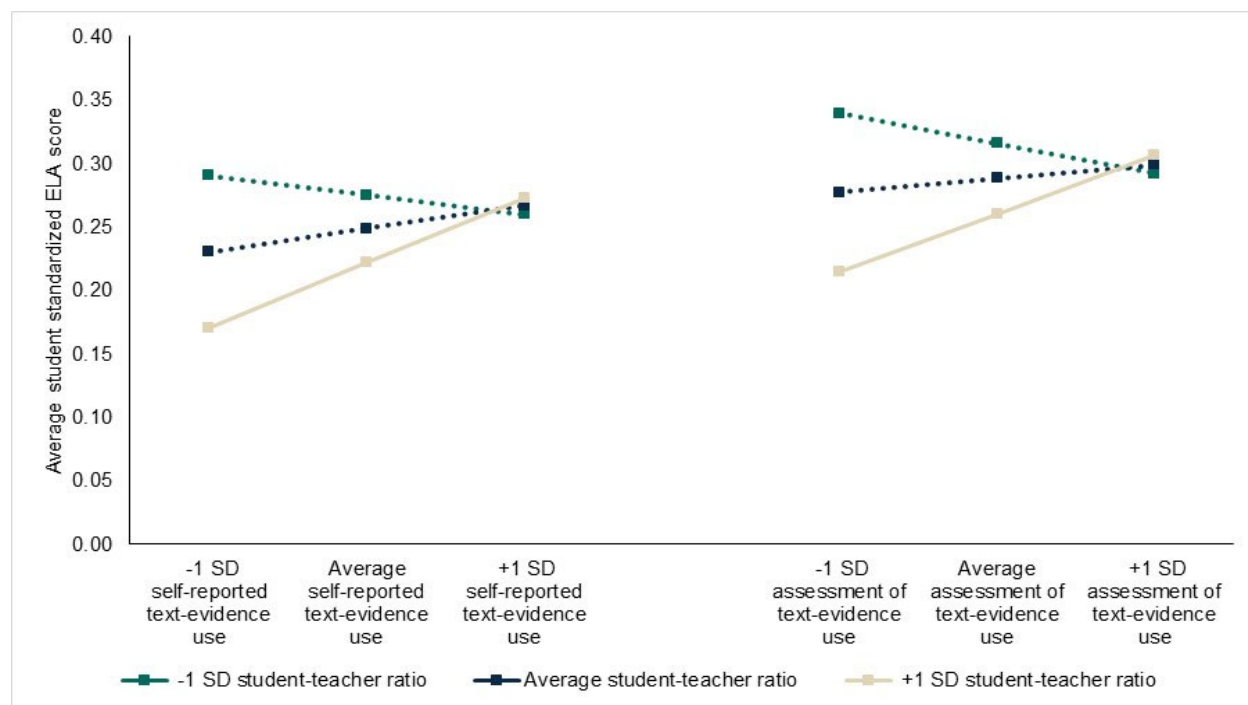


Note:       Solid lines indicate a statistical significance at the 5 percent level, two-tailed test.

### c.    Total number of students

The number of students at a school had both positive and negative moderating effects on the relationships between certain teacher instructional practices and student achievement (Table III.3).[4] When the number of students was higher, the use of connected lessons had a statistically significant positive relationship with student achievement (see Figure III.3). The use of collaborative discussion practices had a statistically significant association with higher student achievement when the total number of students was lower (see Figure III.3). This could indicate that collaborative discussion practices might be easier to facilitate in schools with fewer students

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[4] In this sample, the average total number of students was 535.4, with a standard deviation of 212.05 (see Appendix Table B.1).

perhaps because students have more familiarity with one another, which can help facilitate dialogue between students. As a result, students in small schools can benefit more from these instructional practices.

Teachers' use of online writing had a statistically significant negative relationship with student achievement when the total number of students was higher. Online writing (for example, creating content blogs, developing scripts for a webcast) requires students to have access to different types of technology equipment at school. One assumption is that larger-sized schools might not have a sufficient supply of equipment for each student to use for the necessary amount of time to experience the benefits of the online writing activity.

**Figure III.3. School-level total number of students moderating the relationships between teacher instructional practices and student achievement**
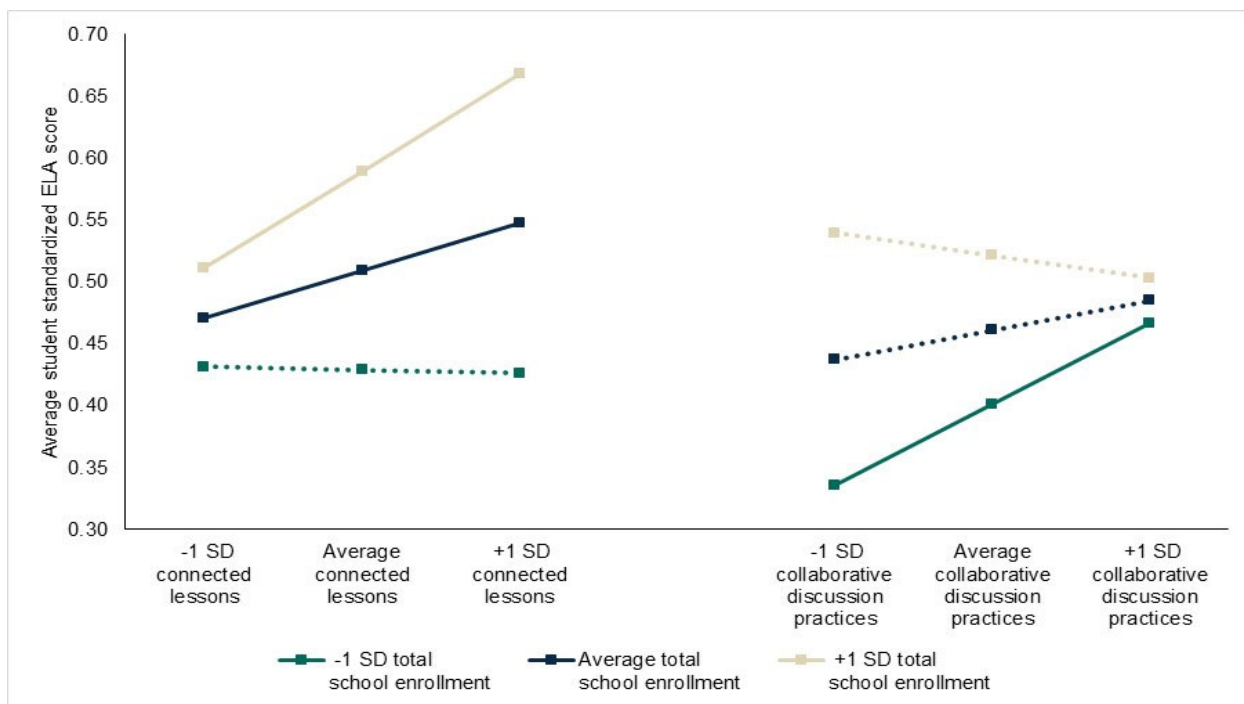


Note:      Solid lines indicate a statistical significance at the 5 percent level, two-tailed test.

### d.  TPP status

Students writing for multiple purposes and audiences had a statistically significant positive association with student achievement in TPP control schools, but the instructional practice did not have a relationship that was statistically significant with student achievement among TPP treatment schools (see Table III.3, Figure III.4). A possible explanation for this could be the variability of instructional practices used in TPP treatment schools relative to those in TPP control schools. Because TPP treatment schools used the same ELA curriculum and received the same professional development supports, teachers in TPP schools could have had relatively similar approaches in terms of the extent to which they encouraged their students to write for

multiple purposes and audiences. In contrast, the heterogeneity of curricula used by TPP control schools might have led to differences in the schools' emphasis on writing for multiple audiences.

On the other hand, a focus on content knowledge development had a statistically significant negative association in TPP control schools, but this instructional practice did not have a relationship that was statistically significant with student achievement among TPP schools (Figure III.4). That there was no relationship with student achievement within TPP treatment schools might again be explained by their use of the same curriculum (and thus might have developed content knowledge to a similar extent), but the negative relationship among TPP control schools requires further investigation. For example, although teachers can devote class time to and emphasize the importance of developing students' content knowledge, how they use the instructional practice might determine whether students are acquiring the knowledge.

**Figure III.4. School-level TPP status moderating the relationships between teacher instructional practices and student achievement**
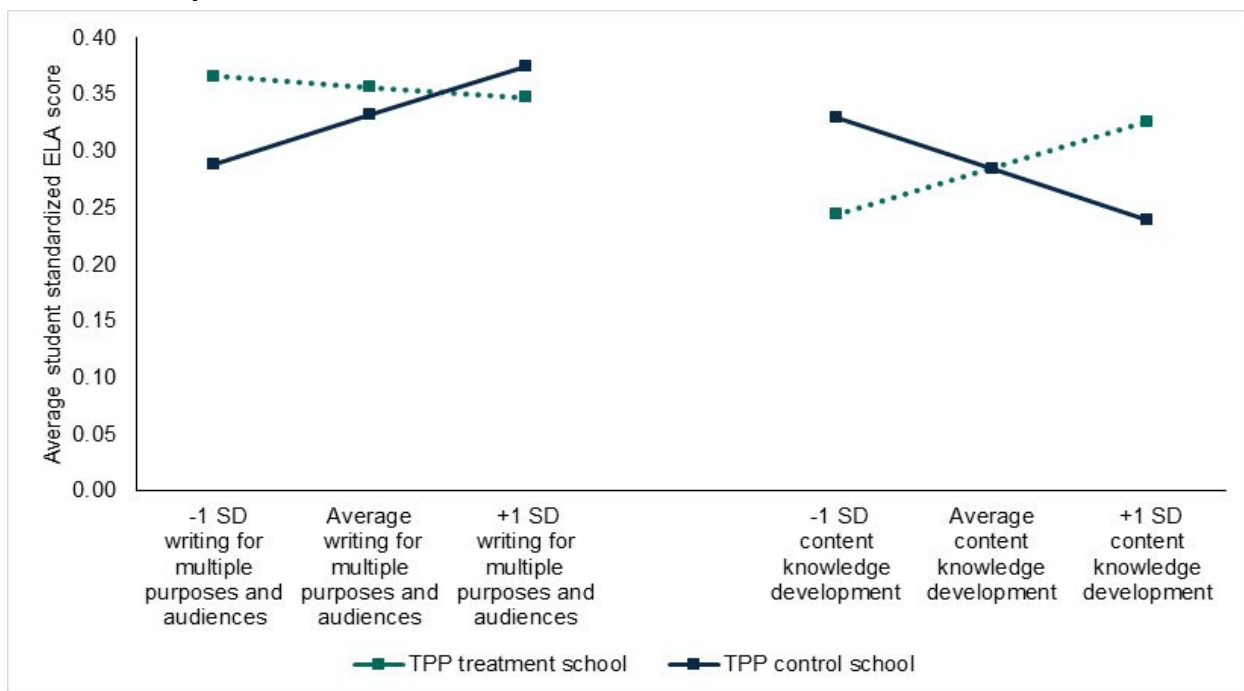


Note:     Solid lines indicate a statistical significance at the 5 percent level, two-tailed test.

## 2.    Student-level characteristics

A given practice might have different associations with achievement depending on the characteristics of the student being taught. For the most part, our analysis showed that the relationships between teacher instructional practices and student achievement were not moderated by student characteristics. There was little evidence that the relationships between instructional practices and student achievement vary for students with the characteristics tested in this study; however, other student attributes, such as a student's motivation, self-efficacy, or

level of interest in the subject matter, might influence the reported effectiveness of different instructional practices. These other attributes warrant further exploration.

The few student-level characteristics that had a moderating effect in our analysis, presented in Table III.3, included the following:

### a.   Student race and ethnicity

There was a statistically significant positive relationship between teachers' use of connected lessons and student achievement for non-White students. For Black non-Hispanic students, higher levels of teachers' self-reported classroom management had a statistically significant positive relationship with student achievement (see Figure III.5). The reason these relationships between these instructional practices and student achievement vary by students' race and ethnicity is not clear The literature on culturally responsive teaching stresses the important role that students' race and ethnicity play in their learning and how teachers' instructional strategies and content must relate to students' cultural backgrounds (Brown 2007). It may be that in order for teachers to effectively relate instruction to students' cultural backgrounds and personal experiences, they must first provide students with a clear understanding of what the instructional focus is, which having connected lessons can help provide. This could be especially important for racially and ethnically diverse students. Moreover, culturally appropriate management strategies include teachers' commitment to building caring classroom communities (Weinstein et al. 2004). Teachers' classroom management approaches, such as emphasizing students' positive character traits and values in the classroom, acknowledging positive student behavior, and setting clear expectations for student behavior, can help foster a caring classroom community and promote student learning for racially and ethnically diverse students. However, further exploration is needed to better understand the relationships between these instructional practices and student achievement for racially and ethnically diverse students.

**Figure III.5. Student-level race and ethnicity moderating the relationships between teacher instructional practices and student achievement**
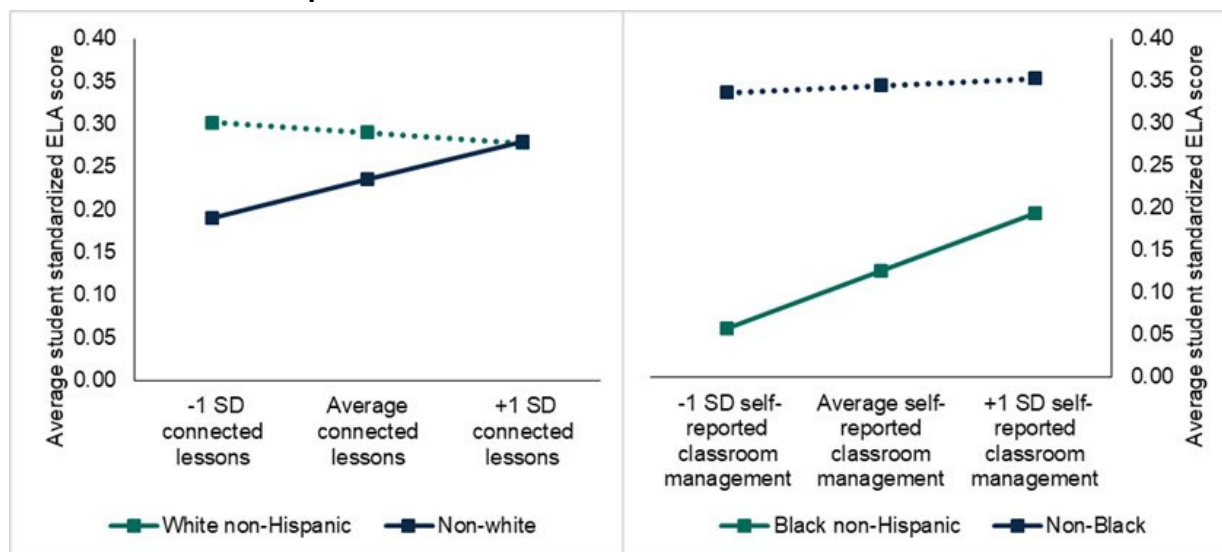


Note:      Solid lines indicate a statistical significance at the 5 percent level, two-tailed test.

### b.   Student eligibility for FRPL

A statistically significant positive relationship existed between teachers' use of writing conventions and student achievement for students who were not eligible for FRPL but not for the lower-income students who were eligible for FRPL (see Figure III.6). Although prior research has examined how students of a lower socioeconomic status may receive lower quality writing assignments at school (Matsumura et al. 2002) and have lower writing scores (Salahu-Din et al. 2008) than their peers of a higher socioeconomic status, the literature is less clear on why students' FRPL status may moderate the relationship between teachers' use of writing conventions and student achievement. One possible explanation is that teachers might increase their instruction on students' writing conventions if they feel students are already demonstrating strengths in other areas of writing, such as the quality of the content and its organization.

**Figure III.6. Student-level FRPL eligibility moderating the relationships between use of writing conventions and student achievement**
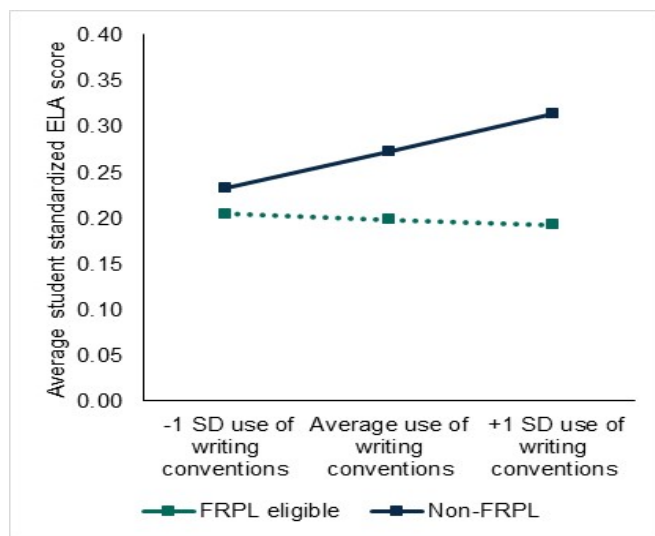


Note:       Solid line indicates a statistical significance at the 5 percent level, two-tailed test.

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# IV. CONCLUSION

The findings presented in this study add to the growing body of research that shows how teachers' instructional practices, general and subject-specific, are positively associated with student outcomes (Cohen and Hill, 2000; Kane et al. 2011; Rowan et al. 2002; Scheerens and Bosker 1997; Wenglinsky 2002). Among the 32 teacher instructional practice measures examined in this analysis, aspects of teachers' general instruction and classroom management, and not reading and writing instruction, had statistically significant associations with student achievement after controlling for other school-level and student-level characteristics. Specifically, fostering student engagement, having students participate in discussion, experiencing fewer class period disruptions, and instilling a classroom climate conducive to instruction each was associated with higher levels of student achievement. These practices can be viewed through the lens of teachers' maximizing the amount of active teaching and learning that is occurring in the classroom (Rowan et al. 2002). However, teachers' use of connecting instruction to students' personal experiences or the real world and classroom management practices to redirect student misbehavior both had a negative relationship with achievement. These practices represent different ways in which teachers might choose or need to spend the finite amount of time they have with their students in a class period, and suggest that the more these practices occur, the more they could take away from delivering the central focus of the instruction.

The moderation analysis showed that schools' racial and ethnic diversity, student–teacher ratios, and total number of students are related to how teacher instructional practices are associated with student achievement. For example, the frequency in which teachers had students read, write, and/or speak about texts was also positively related to student achievement in schools that had higher-than-average racial and ethnic diversity. The frequency and importance of students' use of text evidence were positively related to higher levels of student achievement in the context of relatively higher-than-average student–teacher ratios. Although future studies are needed to examine why these relationships might be occurring, in total, they highlight that there might not necessarily be a one-size-fits-all approach to identify effective teaching practices. Researchers and educators might need to consider the larger school context when aiming to improve student achievement.

The goal of this study was to explore how teachers' instructional practices are associated with student achievement and whether these relationships differ by other school or student factors. The findings presented here highlight various nuances to consider to better understand teachers' effectiveness and provides avenues in need of further research to fully support student learning and students' preparedness for college and career. However, it is important to acknowledge several limitations when interpreting the results. The associations between instructional practices and achievement are correlational, and thus can reflect either the effect of how instructional practices improve student achievement or how students' levels of achievement are influencing the types of practices teachers decide to use in their classrooms. Alternatively, an association between a measured instructional practice and achievement might be present if the practice itself has no effect on achievement but is correlated with some other practices the teacher uses that do

affect achievement. Additionally, we conducted a large number of regression analyses as part of this exploratory study, and although we noted which findings remained after adjusting for multiple comparisons, the potential for having false-positive findings still exists. As a result, additional studies are needed to examine the relationships explored in this analysis and the possible mechanisms that can explain their occurrence.

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# Appendix A:

## Teacher instructional practices

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This appendix presents supplemental information on the teacher instructional practices. Table A.1 provides information on the various topics and specific teacher instructional practices within the broader areas of general instruction, reading and writing instruction, and classroom management and environment.

**Table A.1. Teacher instructional practices: topics, constructs, and construct descriptions**

| Topic | Construct (Number of items) | Construct description |
|---|---|---|
| **General instruction area** | | |
| Connected lessons | Connected lessons (2) | Activities within a lesson were connected to one another and the lesson included a summary at the end to synthesize learning. |
| | Stated learning purpose (2) | The teacher or students stated the purpose of instruction out loud and the teacher referred back to the purpose of instruction during the lesson. |
| Connections to world | Learning connected to personal experiences or real world (3) | The students and teacher connected students' learning—including through reading activities and with academic vocabulary instruction—to the real world or a personal example. |
| Content knowledge | Content knowledge development (3) | The extent to which and the amount of class time the teacher focused on building students' content knowledge and the degree to which content knowledge was connected to the main point of the lesson. |
| | Demonstrate content knowledge in writing (2) | When grading, evaluating, or providing feedback to students' writing, the degree to which teachers felt it important that students demonstrate their content knowledge. |
| Higher-order thinking | Assessment of higher-order thinking (4) | The extent to which teachers felt the development of ideas and use of evidence to support ideas, and quality of writing were important when grading or evaluating students' writing, and when providing students with feedback on their writing. |
| | Higher-order thinking and reading (7) | The frequency with which teachers focused on the following when students read texts in class: text analysis, analyzing differences and similarities in perspectives between multiple texts on the same topic, critiquing or evaluating arguments and specific claims in context, determining central idea(s) or theme(s) of the text, determining the author's point of view or purpose, integrating or comparing and contrasting information in different media or formats, and integrating or interpreting information across sections of the text. |
| | Observed higher-order thinking (7) | The extent to which the teacher asked higher-order thinking questions either verbally or in writing, reinforced higher-order thinking in class, supported students' analysis of text, and asked questions to encourage students' to think at a higher level, including probing questions or follow-up questions. |
| Multimedia use | Online writing (2) | The frequency with which teachers asked students to create videos or webcasts and the frequency with which teachers asked students to write for social networking, blogs, or wikis. |
| | Use of multimedia in instruction (3) | Whether the teacher used the following in the class period to provide instruction: (1) chalk board, smart board, projector, or chart paper; (2) games, role-play, drama; and (3) films, videos, music, and art. |
| Students' prior knowledge | Prior knowledge (2) | The frequency with which teachers asked students to relate what they read to their own experience or to something they have learned before in the past two weeks, and how often teachers focus on having students relate the story or literary work, its |

| Topic | Construct (Number of items) | Construct description |
|---|---|---|
| | | characters, and/or its themes to something they have read before when students read texts in class. |
| Student independence | Student independence (3) | The frequency with which teachers encouraged students to engage in the following behaviors in the past two weeks: to ask for more challenging work, to check their own progress against learning targets, to give input in setting the learning targets, and to help develop rubrics or evaluation criteria against learning targets. |
| Student participation | Collaborative discussion practices (4) | The frequency with which teachers' supported students' discussion practices to respond to peer comments and/or build on each other's thinking, whether the teacher used student pair or group work in the class period, whether the teacher asked other students to help answer the question in discussions, and the degree of thoughtfulness of students' responses during discussion. |
| | Student engagement in class (2) | The approximate proportion of students who struggled to stay on task during the class period and whether the majority of students were on task for almost all the class period. |
| | Student participation in discussion (2) | The extent to which students participated in class and the extent to which students spoke most in class. |
| Student responsibility for learning | Student responsibility for their learning (3) | The frequency with which students were supported to provide feedback on each other's work, share their work with their peers, and work with other students in the past two weeks. |
| **Reading and writing practice area** | | |
| Academic vocabulary | Academic vocabulary (2) | Degree to which the teacher focused on academic vocabulary instruction and whether students engaged in reading activities focused on determining word meanings from texts. |
| Multiple types and purposes of writing | Engagement in multiple types of writing (2) | Number of writing purposes, genres, and modes of writing teachers asked students to engage in. |
| | Writing for multiple purposes and audiences (2) | Number of audiences and types of writing (for example, writing to inform or writing to argue). |
| Reading, writing, and/or speaking about texts | Close reading and writing that demonstrates understanding of text (5) | Whether teachers asked students to engage in close reading or to review the text to find evidence to support a viewpoint. Whether teachers asked students to write to demonstrate their understanding of the text and to cite sources or evidence from texts. |
| | Reading, writing, and/or speaking about texts in past two weeks (4) | Frequency with which teachers supported students as they discussed texts they read with partners or a small group of students, produced extended writing by incorporating key details from texts they read, shared their ideas about and/or understanding the texts they read with the whole class, and wrote about texts they read in the past two weeks. |
| | Reading, writing, and/or speaking about texts in typical week (5) | Frequency with which teachers asked students to do a group activity or project about what they have read, to explain or support their understanding of what they have read, to write about something they have read, to read books they have chosen themselves, and to describe the style or structure of the text they have read in a given week. |
| Use of text evidence | Assessment of text-evidence use (2) | The importance of the accuracy or appropriateness of students' references to texts when teachers graded or evaluated students' writing and provided students with feedback on their writing. |
| | Self-reported text-evidence use (2) | In the past two weeks, the frequency with which teachers asked students to write citing evidence or information from text(s) and to |

| Topic | Construct (Number of items) | Construct description |
|---|---|---|
| | | write thinking tasks, such as graphic organizers, that capture students' thoughts on the text and relevant evidence. |
| | Text-evidence use and argument writing (4) | Whether the teacher asked students to cite evidence from the text to support their responses either verbally or in writing. Whether teachers supported students' argument in writing and writing activities that involved citing sources or evidence with or without the teacher's help. |
| Writing conventions | Feedback on writing conventions (6) | The importance of writing conventions and effective use of language when teachers graded or evaluated students' writing or provided feedback on students' writing. The importance of the organization of ideas when teachers graded or evaluated students' writing. |
| | Use of writing conventions (2) | Teachers asked students to write to practice writing conventions and students engaged in writing activities that involved writing conventions. |
| **Classroom management and environment area** | | |
| Classroom climate | Classroom climate (6) | Degree to which the teacher and students demonstrated respect for one another. Degree to which the teacher was warm, supportive, and passionate about what they were teaching. Proportion of students who were receptive to the teacher's instructions and feedback and were motivated. Degree to which teacher successfully encouraged students to interact with one another. |
| Classroom management | Classroom disruption (reverse) (3) | The extent to which students disrupted class for more than 5 minutes and more than 10 minutes. The extent to which transitions between activities took more than 5 minutes. The items in this construct were reverse coded to have a similar scale as other constructs (that is, higher scores are more positive instructional practices than lower scores). |
| | Observed classroom management (3) | Degree to which teachers' attempts to redirect student disruptions were effective and teachers enforced behavioral rules in the classroom. Whether teachers' redirection of student disruption took away from learning time. |
| | Self-reported classroom management (6) | The extent to which teachers emphasized positive character traits and values in the classroom, managed their class well, acknowledged positive student behavior, redirected students back to the topic when they get off-task, required that students in the classroom follow the rules at all times, and set clear expectations for student behavior. |

Source:   Dolfin et al. 2019.

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# Appendix B:

## Descriptive characteristics of the analytic sample

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This appendix provides additional information on the characteristics of the analytic sample. Table B.1 presents the descriptive statistics of the characteristics that were included in the regression models used to estimate the relationships between teacher instructional practices and student achievement.

**Table B.1. Descriptive characteristics of the study's analytic sample**

| School-level and student-level characteristics | Overall mean | Standard deviation | Minimum | Maximum |
|---|---|---|---|---|
| Charter school status (percentage) | 1.6 | 0.13 | 0 | 100 |
| Student female (percentage) | 48.5 | 0.50 | 0 | 100 |
| Student special education (percentage) | 10.3 | 0.30 | 0 | 100 |
| Student English language learners (percentage) | 7.9 | 0.27 | 0 | 100 |
| Student eligible for free or reduced-price lunch (percentage) | 59.5 | 0.49 | 0 | 100 |
| Student race and ethnicity (percentage) | | | | |
| White non-Hispanic | 38.2 | 0.49 | 0 | 100 |
| Black non-Hispanic | 33.9 | 0.47 | 0 | 100 |
| Hispanic | 19.8 | 0.40 | 0 | 100 |
| Other race | 7.9 | 0.27 | 0 | 100 |
| School-level racial and ethnic diversity | 0.4 | 0.23 | 0 | 0.7 |
| Number of students enrolled | 535.4 | 212.05 | 147 | 1175 |
| Number of full-time teachers | 35.4 | 13.03 | 15 | 85 |
| Student-teacher ratio | 15.2 | 3.47 | 8.6 | 25.1 |
| Teachers who are novice (percentage) | 46.1 | 0.38 | 0 | 100 |
| Average student standardized ELA pretest scores | -0.4 | 0.93 | -4.7 | 3.0 |

Note:    The summary statistics are based on the largest analytic sample in this study, which includes 63 schools, 214 teachers, and 10,716 students.

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# Appendix C:

## Analyses of teacher instructional practices

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This appendix provides additional information on the regression models. Table C.1 presents the full set of estimates from the regression models used to estimate the relationships between teacher instructional practices and student achievement. Table C.2 presents the full set of estimates from the regression models that examined the extent to which school-level and student-level characteristics moderated the relationships between teacher instructional practices and student achievement.

**Table C.1. Regression analysis of student achievement on teacher instructional practices**

| Teacher instructional practice | Estimated interaction coefficient | Standard error | *p*-value | Analytic sample size |
|---|---|---|---|---|
| **General instruction area** | | | | |
| Connected lessons | 0.128 | (0.08) | 0.11 | 9,234 |
| Stated learning purpose | -0.003 | (0.05) | 0.96 | 9,234 |
| Learning connected to personal experiences or real world | -0.177** | (0.07) | 0.01 | 9,234 |
| Content knowledge development | -0.019 | (0.05) | 0.71 | 9,234 |
| Demonstrate content knowledge in writing | -0.009 | (0.07) | 0.89 | 10,680 |
| Assessment of higher-order thinking | 0.001 | (0.09) | 0.99 | 10,680 |
| Higher order thinking and reading | -0.005 | (0.07) | 0.94 | 10,680 |
| Observed higher-order thinking | 0.085 | (0.07) | 0.20 | 9,234 |
| Online writing | -0.024 | (0.05) | 0.66 | 10,680 |
| Use of multimedia in instruction | 0.083 | (0.09) | 0.37 | 9,234 |
| Student prior knowledge | 0.022 | (0.07) | 0.76 | 10,680 |
| Student independence | -0.008 | (0.08) | 0.92 | 10,702 |
| Collaborative discussion practices | 0.167 | (0.09) | 0.06 | 9,234 |
| Student engagement in class | 0.223** | (0.06) | <0.01 | 9,234 |
| Student participation in discussion | 0.153* | (0.06) | 0.01 | 9,234 |
| Student responsibility for their learning | 0.136 | (0.09) | 0.12 | 10,702 |
| **Reading and writing instruction area** | | | | |
| Academic vocabulary | -0.060 | (0.07) | 0.43 | 9,234 |
| Engagement in multiple types of writing | -0.022 | (0.03) | 0.52 | 9,234 |
| Writing for multiple purposes and audiences | 0.072 | (0.07) | 0.30 | 10,680 |
| Close reading and writing that demonstrates understanding of texts | -0.076 | (0.06) | 0.23 | 9,234 |
| Reading, writing, and/or speaking about texts in past two weeks | 0.110 | (0.10) | 0.29 | 10,680 |
| Reading, writing, and/or speaking about texts in typical week | 0.102 | (0.11) | 0.36 | 10,680 |
| Assessment of text evidence use | 0.002 | (0.11) | 0.98 | 10,680 |
| Self-reported text evidence use | 0.113 | (0.11) | 0.29 | 10,680 |
| Text evidence use and argument writing | -0.072 | (0.08) | 0.36 | 9,234 |
| Feedback on writing conventions | 0.056 | (0.06) | 0.39 | 10,680 |
| Use of writing conventions | 0.087 | (0.09) | 0.35 | 9,234 |

| Teacher instructional practice | Estimated interaction coefficient | Standard error | p-value | Analytic sample size |
|---|---|---|---|---|
| **Classroom management and environment area** | | | | |
| Classroom climate | 0.290** | (0.07) | <0.01 | 9,234 |
| Classroom disruption (reverse)[a] | 0.153** | (0.05) | 0.01 | 10,610 |
| Observed classroom management | -0.188** | (0.07) | 0.01 | 9,234 |
| Self-reported classroom management | 0.118 | (0.09) | 0.18 | 10,716 |
| **Overall ELA instructional practices** | | | | |
| Overall ELA instructional practices | 0.007 | (0.01) | 0.28 | 8,365 |

Note:     A separate regression analysis was performed for each teacher instructional practice. Each analysis included the following student-level controls: standardized ELA pretest score, standardized mathematics pretest score, race (White non-Hispanic, Black non-Hispanic, and Hispanic), FRPL eligibility, gender, special education status, and English learner status; the following school-level controls: TPP status, racial and ethnic diversity, student–teacher ratio, total number of students, charter status, number of full-time teachers, and percentage of students eligible for FRPL; as well as teacher novice status. Standard errors are clustered at the school level.

[a]Construct was reverse coded so that higher values indicate fewer occurrences of student disruptions.

*Statistically significant at the 5 percent level, two-tailed test.
**Statistically significant at the 1 percent level, two-tailed test.

**Table C.2. Summary of regression analysis on moderating the relationship between teacher instructional practices and student achievement**

| Teacher instructional practice | Moderating variable | Estimated interaction coefficient | Standard error | *p*-value | Analytic sample size |
|---|---|---|---|---|---|
| **General instruction area** | | | | | |
| Connected lessons | Student White non-Hispanic | -0.281* | (0.11) | 0.01 | 9,234 |
| | Student Black non-Hispanic | 0.093 | (0.11) | 0.38 | 9,234 |
| | Student Hispanic | 0.083 | (0.14) | 0.56 | 9,234 |
| | Student FRPL eligibility | 0.061 | (0.08) | 0.43 | 9,234 |
| | TPP status | 0.171 | (0.14) | 0.22 | 9,234 |
| | School-level racial and ethnic diversity | 0.441 | (0.35) | 0.22 | 9,234 |
| | Student-teacher ratio | 0.059* | (0.03) | 0.03 | 9,234 |
| | Total number of students | 0.001* | (0.00) | 0.05 | 9,234 |
| Stated learning purpose | Student White non-Hispanic | -0.120* | (0.05) | 0.03 | 9,234 |
| | Student Black non-Hispanic | 0.061 | (0.07) | 0.39 | 9,234 |
| | Student Hispanic | 0.108 | (0.07) | 0.14 | 9,234 |
| | Student FRPL eligibility | -0.047 | (0.06) | 0.39 | 9,234 |
| | TPP status | 0.107 | (0.10) | 0.28 | 9,234 |
| | School-level racial and ethnic diversity | 0.203 | (0.19) | 0.29 | 9,234 |
| | Student-teacher ratio | -0.017 | (0.01) | 0.17 | 9,234 |
| | Total number of students | -0.000 | (0.00) | 0.70 | 9,234 |
| Learning connected to personal experiences or real world | Student White non-Hispanic | 0.004 | (0.09) | 0.97 | 9,234 |
| | Student Black non-Hispanic | 0.083 | (0.10) | 0.43 | 9,234 |
| | Student Hispanic | -0.044 | (0.10) | 0.64 | 9,234 |
| | Student FRPL eligibility | -0.092 | (0.08) | 0.27 | 9,234 |
| | TPP status | 0.008 | (0.14) | 0.96 | 9,234 |
| | School-level racial and ethnic diversity | -0.134 | (0.36) | 0.71 | 9,234 |
| | Student-teacher ratio | 0.002 | (0.01) | 0.87 | 9,234 |
| | Total number of students | -0.000 | (0.00) | 0.58 | 9,234 |
| Content knowledge development | Student White non-Hispanic | 0.028 | (0.07) | 0.69 | 9,234 |
| | Student Black non-Hispanic | 0.004 | (0.09) | 0.96 | 9,234 |
| | Student Hispanic | -0.008 | (0.09) | 0.93 | 9,234 |
| | Student FRPL eligibility | 0.058 | (0.06) | 0.31 | 9,234 |
| | TPP status | 0.296** | (0.08) | <0.01 | 9,234 |
| | School-level racial and ethnic diversity | -0.144 | (0.23) | 0.54 | 9,234 |
| | Student-teacher ratio | -0.004 | (0.01) | 0.65 | 9,234 |
| | Total number of students | -0.000 | (0.00) | 0.07 | 9,234 |
| Demonstrate content knowledge in writing | Student White non-Hispanic | -0.057 | (0.10) | 0.55 | 10,680 |
| | Student Black non-Hispanic | 0.018 | (0.09) | 0.84 | 10,680 |
| | Student Hispanic | 0.009 | (0.10) | 0.93 | 10,680 |
| | Student FRPL eligibility | 0.001 | (0.08) | 0.99 | 10,680 |
| | TPP status | 0.067 | (0.14) | 0.63 | 10,680 |
| | School-level racial and ethnic diversity | 0.183 | (0.21) | 0.40 | 10,680 |
| | Student-teacher ratio | 0.007 | (0.02) | 0.75 | 10,680 |
| | Total number of students | 0.000 | (0.00) | 0.98 | 10,680 |
| Assessment of higher-order thinking | Student White non-Hispanic | -0.063 | (0.14) | 0.66 | 10,680 |
| | Student Black non-Hispanic | 0.032 | (0.12) | 0.80 | 10,680 |
| | Student Hispanic | 0.114 | (0.13) | 0.38 | 10,680 |
| | Student FRPL eligibility | -0.020 | (0.09) | 0.82 | 10,680 |
| | TPP status | -0.025 | (0.17) | 0.88 | 10,680 |
| | School-level racial and ethnic diversity | 0.672* | (0.28) | 0.02 | 10,680 |
| | Student-teacher ratio | 0.014 | (0.02) | 0.44 | 10,680 |
| | Total number of students | 0.000 | (0.00) | 0.48 | 10,680 |
| Higher-order thinking and reading | Student White non-Hispanic | 0.022 | (0.09) | 0.81 | 10,680 |
| | Student Black non-Hispanic | -0.100 | (0.10) | 0.32 | 10,680 |
| | Student Hispanic | -0.058 | (0.12) | 0.63 | 10,680 |
| | Student FRPL eligibility | -0.052 | (0.07) | 0.47 | 10,680 |

| Teacher instructional practice | Moderating variable | Estimated interaction coefficient | Standard error | *p*-value | Analytic sample size |
|---|---|---|---|---|---|
| | TPP status | -0.133 | (0.15) | 0.37 | 10,680 |
| | School-level racial and ethnic diversity | 0.637* | (0.25) | 0.01 | 10,680 |
| | Student-teacher ratio | 0.007 | (0.02) | 0.70 | 10,680 |
| | Total number of students | -0.000 | (0.00) | 0.59 | 10,680 |
| Observed higher-order thinking | Student White non-Hispanic | -0.037 | (0.08) | 0.64 | 9,234 |
| | Student Black non-Hispanic | 0.010 | (0.12) | 0.94 | 9,234 |
| | Student Hispanic | -0.004 | (0.10) | 0.96 | 9,234 |
| | Student FRPL eligibility | 0.010 | (0.08) | 0.91 | 9,234 |
| | TPP status | 0.003 | (0.13) | 0.98 | 9,234 |
| | School-level racial and ethnic diversity | 0.067 | (0.34) | 0.84 | 9,234 |
| | Student-teacher ratio | 0.008 | (0.02) | 0.63 | 9,234 |
| | Total number of students | -0.001 | (0.00) | 0.11 | 9,234 |
| Online writing | Student White non-Hispanic | 0.018 | (0.09) | 0.84 | 10,680 |
| | Student Black non-Hispanic | -0.012 | (0.07) | 0.87 | 10,680 |
| | Student Hispanic | -0.018 | (0.10) | 0.87 | 10,680 |
| | Student FRPL eligibility | 0.057 | (0.05) | 0.28 | 10,680 |
| | TPP status | -0.148 | (0.11) | 0.19 | 10,680 |
| | School-level racial and ethnic diversity | -0.026 | (0.19) | 0.89 | 10,680 |
| | Student-teacher ratio | 0.006 | (0.03) | 0.83 | 10,680 |
| | Total number of students | -0.001* | (0.00) | 0.02 | 10,680 |
| Use of multimedia in instruction | Student White non-Hispanic | -0.138 | (0.12) | 0.26 | 9,234 |
| | Student Black non-Hispanic | 0.087 | (0.12) | 0.47 | 9,234 |
| | Student Hispanic | 0.045 | (0.12) | 0.70 | 9,234 |
| | Student FRPL eligibility | 0.104 | (0.11) | 0.36 | 9,234 |
| | TPP status | 0.180 | (0.16) | 0.26 | 9,234 |
| | School-level racial and ethnic diversity | 0.265 | (0.41) | 0.52 | 9,234 |
| | Student-teacher ratio | -0.058** | (0.01) | <0.01 | 9,234 |
| | Total number of students | -0.000 | (0.00) | 0.44 | 9,234 |
| Student prior knowledge | Student White non-Hispanic | 0.024 | (0.08) | 0.75 | 10,680 |
| | Student Black non-Hispanic | -0.083 | (0.10) | 0.42 | 10,680 |
| | Student Hispanic | -0.057 | (0.09) | 0.54 | 10,680 |
| | Student FRPL eligibility | -0.079 | (0.08) | 0.35 | 10,680 |
| | TPP status | -0.208 | (0.15) | 0.18 | 10,680 |
| | School-level racial and ethnic diversity | 0.421 | (0.28) | 0.14 | 10,680 |
| | Student-teacher ratio | -0.014 | (0.02) | 0.55 | 10,680 |
| | Total number of students | -0.000 | (0.00) | 0.53 | 10,680 |
| Student independence | Student White non-Hispanic | 0.159 | (0.13) | 0.23 | 10,702 |
| | Student Black non-Hispanic | -0.144 | (0.11) | 0.18 | 10,702 |
| | Student Hispanic | -0.118 | (0.13) | 0.35 | 10,702 |
| | Student FRPL eligibility | -0.112 | (0.10) | 0.27 | 10,702 |
| | TPP status | -0.224 | (0.18) | 0.22 | 10,702 |
| | School-level racial and ethnic diversity | -0.015 | (0.38) | 0.97 | 10,702 |
| | Student-teacher ratio | 0.035 | (0.03) | 0.20 | 10,702 |
| | Total number of students | 0.000 | (0.00) | 0.64 | 10,702 |
| Collaborative discussion practices | Student White non-Hispanic | -0.060 | (0.11) | 0.60 | 9,234 |
| | Student Black non-Hispanic | -0.021 | (0.14) | 0.88 | 9,234 |
| | Student Hispanic | -0.106 | (0.12) | 0.37 | 9,234 |
| | Student FRPL eligibility | 0.004 | (0.09) | 0.97 | 9,234 |
| | TPP status | 0.069 | (0.18) | 0.71 | 9,234 |
| | School-level racial and ethnic diversity | 0.208 | (0.34) | 0.54 | 9,234 |
| | Student-teacher ratio | -0.010 | (0.03) | 0.70 | 9,234 |
| | Total number of students | -0.001* | (0.00) | 0.03 | 9,234 |
| Student engagement in class | Student White non-Hispanic | -0.016 | (0.12) | 0.89 | 9,234 |
| | Student Black non-Hispanic | -0.024 | (0.10) | 0.81 | 9,234 |
| | Student Hispanic | 0.034 | (0.08) | 0.67 | 9,234 |
| | Student FRPL eligibility | 0.063 | (0.09) | 0.50 | 9,234 |
| | TPP status | -0.142 | (0.11) | 0.20 | 9,234 |
| | School-level racial and ethnic diversity | 0.240 | (0.26) | 0.37 | 9,234 |

| Teacher instructional practice | Moderating variable | Estimated interaction coefficient | Standard error | *p*-value | Analytic sample size |
|---|---|---|---|---|---|
| | Student-teacher ratio | 0.013 | (0.01) | 0.15 | 9,234 |
| | Total number of students | 0.000 | (0.00) | 0.93 | 9,234 |
| Student participation in discussion | Student White non-Hispanic | -0.038 | (0.10) | 0.70 | 9,234 |
| | Student Black non-Hispanic | -0.052 | (0.10) | 0.62 | 9,234 |
| | Student Hispanic | -0.077 | (0.10) | 0.43 | 9,234 |
| | Student FRPL eligibility | 0.018 | (0.08) | 0.82 | 9,234 |
| | TPP status | 0.181 | (0.14) | 0.20 | 9,234 |
| | School-level racial and ethnic diversity | 0.233 | (0.27) | 0.40 | 9,234 |
| | Student-teacher ratio | -0.006 | (0.02) | 0.71 | 9,234 |
| | Total number of students | -0.001 | (0.00) | 0.10 | 9,234 |
| Student responsibility for their learning | Student White non-Hispanic | 0.038 | (0.12) | 0.75 | 10,702 |
| | Student Black non-Hispanic | -0.091 | (0.12) | 0.44 | 10,702 |
| | Student Hispanic | -0.032 | (0.12) | 0.80 | 10,702 |
| | Student FRPL eligibility | -0.041 | (0.11) | 0.72 | 10,702 |
| | TPP status | 0.020 | (0.17) | 0.91 | 10,702 |
| | School-level racial and ethnic diversity | 0.380 | (0.36) | 0.30 | 10,702 |
| | Student-teacher ratio | 0.023 | (0.02) | 0.33 | 10,702 |
| | Total number of students | -0.000 | (0.00) | 0.39 | 10,702 |
| **Reading and writing instruction area** | | | | | |
| Academic vocabulary | Student White non-Hispanic | 0.132 | (0.08) | 0.09 | 9,234 |
| | Student Black non-Hispanic | -0.017 | (0.10) | 0.86 | 9,234 |
| | Student Hispanic | -0.154 | (0.11) | 0.15 | 9,234 |
| | Student FRPL eligibility | -0.202 | (0.11) | 0.06 | 9,234 |
| | TPP status | 0.194 | (0.16) | 0.23 | 9,234 |
| | School-level racial and ethnic diversity | -0.347 | (0.40) | 0.39 | 9,234 |
| | Student-teacher ratio | 0.019 | (0.02) | 0.30 | 9,234 |
| | Total number of students | -0.000 | (0.00) | 0.65 | 9,234 |
| Engagement in multiple types of writing | Student White non-Hispanic | -0.049 | (0.05) | 0.31 | 9,234 |
| | Student Black non-Hispanic | 0.070 | (0.06) | 0.22 | 9,234 |
| | Student Hispanic | 0.022 | (0.06) | 0.73 | 9,234 |
| | Student FRPL eligibility | -0.038 | (0.05) | 0.43 | 9,234 |
| | TPP status | 0.078 | (0.07) | 0.30 | 9,234 |
| | School-level racial and ethnic diversity | -0.092 | (0.15) | 0.55 | 9,234 |
| | Student-teacher ratio | -0.015 | (0.01) | 0.14 | 9,234 |
| | Total number of students | -0.000 | (0.00) | 0.19 | 9,234 |
| Writing for multiple purposes and audiences | Student White non-Hispanic | -0.042 | (0.08) | 0.62 | 10,680 |
| | Student Black non-Hispanic | -0.021 | (0.10) | 0.82 | 10,680 |
| | Student Hispanic | 0.084 | (0.10) | 0.42 | 10,680 |
| | Student FRPL eligibility | 0.092 | (0.10) | 0.34 | 10,680 |
| | TPP status | -0.265* | (0.13) | 0.04 | 10,680 |
| | School-level racial and ethnic diversity | -0.298 | (0.23) | 0.20 | 10,680 |
| | Student-teacher ratio | -0.002 | (0.01) | 0.90 | 10,680 |
| | Total number of students | -0.000 | (0.00) | 0.76 | 10,680 |
| Close reading and writing that demonstrates understanding of texts | Student White non-Hispanic | -0.073 | (0.11) | 0.51 | 9,234 |
| | Student Black non-Hispanic | 0.018 | (0.11) | 0.86 | 9,234 |
| | Student Hispanic | 0.123 | (0.12) | 0.32 | 9,234 |
| | Student FRPL eligibility | -0.106 | (0.09) | 0.23 | 9,234 |
| | TPP status | 0.094 | (0.14) | 0.52 | 9,234 |
| | School-level racial and ethnic diversity | 0.106 | (0.28) | 0.70 | 9,234 |
| | Student-teacher ratio | 0.007 | (0.02) | 0.74 | 9,234 |
| | Total number of students | 0.000 | (0.00) | 0.98 | 9,234 |
| Reading, writing, and/or speaking about texts in past two weeks | Student White non-Hispanic | -0.143 | (0.14) | 0.32 | 10,680 |
| | Student Black non-Hispanic | 0.024 | (0.12) | 0.84 | 10,680 |
| | Student Hispanic | 0.051 | (0.11) | 0.64 | 10,680 |
| | Student FRPL eligibility | 0.043 | (0.11) | 0.70 | 10,680 |
| | TPP status | -0.148 | (0.19) | 0.45 | 10,680 |
| | School-level racial and ethnic diversity | 1.258** | (0.36) | <0.01 | 10,680 |
| | Student-teacher ratio | 0.002 | (0.02) | 0.93 | 10,680 |

| Teacher instructional practice | Moderating variable | Estimated interaction coefficient | Standard error | *p*-value | Analytic sample size |
|---|---|---|---|---|---|
| | Total number of students | -0.000 | (0.00) | 0.77 | 10,680 |
| Reading, writing, and/or speaking about texts in typical week | Student White non-Hispanic | -0.061 | (0.14) | 0.67 | 10,680 |
| | Student Black non-Hispanic | -0.054 | (0.12) | 0.66 | 10,680 |
| | Student Hispanic | -0.053 | (0.14) | 0.70 | 10,680 |
| | Student FRPL eligibility | 0.172 | (0.14) | 0.21 | 10,680 |
| | TPP status | -0.364 | (0.22) | 0.10 | 10,680 |
| | School-level racial and ethnic diversity | 0.839 | (0.50) | 0.10 | 10,680 |
| | Student-teacher ratio | 0.022 | (0.02) | 0.35 | 10,680 |
| | Total number of students | -0.000 | (0.00) | 0.82 | 10,680 |
| Assessment of text evidence use | Student White non-Hispanic | 0.018 | (0.11) | 0.88 | 10,680 |
| | Student Black non-Hispanic | -0.100 | (0.16) | 0.54 | 10,680 |
| | Student Hispanic | -0.001 | (0.21) | 1.00 | 10,680 |
| | Student FRPL eligibility | 0.159 | (0.11) | 0.15 | 10,680 |
| | TPP status | -0.195 | (0.21) | 0.35 | 10,680 |
| | School-level racial and ethnic diversity | 0.045 | (0.37) | 0.90 | 10,680 |
| | Student-teacher ratio | 0.060** | (0.02) | <0.01 | 10,680 |
| | Total number of students | 0.000 | (0.00) | 0.87 | 10,680 |
| Self-reported text evidence use | Student White non-Hispanic | 0.209 | (0.14) | 0.14 | 10,680 |
| | Student Black non-Hispanic | -0.125 | (0.13) | 0.33 | 10,680 |
| | Student Hispanic | -0.199 | (0.11) | 0.08 | 10,680 |
| | Student FRPL eligibility | -0.003 | (0.10) | 0.97 | 10,680 |
| | TPP status | -0.232 | (0.20) | 0.26 | 10,680 |
| | School-level racial and ethnic diversity | 1.010 | (0.52) | 0.06 | 10,680 |
| | Student-teacher ratio | 0.047* | (0.02) | 0.01 | 10,680 |
| | Total number of students | 0.001* | (0.00) | 0.03 | 10,680 |
| Text evidence use and argument writing | Student White non-Hispanic | 0.041 | (0.09) | 0.64 | 9,234 |
| | Student Black non-Hispanic | -0.135 | (0.10) | 0.19 | 9,234 |
| | Student Hispanic | 0.137 | (0.13) | 0.28 | 9,234 |
| | Student FRPL eligibility | -0.078 | (0.09) | 0.41 | 9,234 |
| | TPP status | 0.177 | (0.16) | 0.27 | 9,234 |
| | School-level racial and ethnic diversity | -0.011 | (0.34) | 0.97 | 9,234 |
| | Student-teacher ratio | 0.020 | (0.02) | 0.37 | 9,234 |
| | Total number of students | 0.000 | (0.00) | 0.37 | 9,234 |
| Feedback on writing conventions | Student White non-Hispanic | 0.052 | (0.11) | 0.64 | 10,680 |
| | Student Black non-Hispanic | -0.118 | (0.10) | 0.24 | 10,680 |
| | Student Hispanic | 0.079 | (0.12) | 0.49 | 10,680 |
| | Student FRPL eligibility | -0.062 | (0.08) | 0.43 | 10,680 |
| | TPP status | -0.143 | (0.15) | 0.34 | 10,680 |
| | School-level racial and ethnic diversity | 0.612** | (0.28) | 0.03 | 10,680 |
| | Student-teacher ratio | 0.018 | (0.01) | 0.22 | 10,680 |
| | Total number of students | 0.000 | (0.00) | 0.49 | 10,680 |
| Use of writing conventions | Student White non-Hispanic | 0.132 | (0.13) | 0.31 | 9,234 |
| | Student Black non-Hispanic | -0.234 | (0.16) | 0.16 | 9,234 |
| | Student Hispanic | 0.088 | (0.14) | 0.54 | 9,234 |
| | Student FRPL eligibility | -0.279** | (0.07) | <0.01 | 9,234 |
| | TPP status | 0.182 | (0.23) | 0.43 | 9,234 |
| | School-level racial and ethnic diversity | 0.407 | (0.34) | 0.24 | 9,234 |
| | Student-teacher ratio | -0.057* | (0.02) | 0.02 | 9,234 |
| | Total number of students | -0.001 | (0.00) | 0.29 | 9,234 |
| **Classroom management and environment area** | | | | | |
| Classroom climate | Student White non-Hispanic | -0.015 | (0.14) | 0.92 | 9,234 |
| | Student Black non-Hispanic | -0.029 | (0.11) | 0.79 | 9,234 |
| | Student Hispanic | 0.059 | (0.12) | 0.62 | 9,234 |
| | Student FRPL eligibility | -0.065 | (0.07) | 0.35 | 9,234 |
| | TPP status | -0.071 | (0.15) | 0.65 | 9,234 |
| | School-level racial and ethnic diversity | 0.371 | (0.42) | 0.38 | 9,234 |
| | Student-teacher ratio | -0.006 | (0.02) | 0.80 | 9,234 |
| | Total number of students | -0.001 | (0.00) | 0.30 | 9,234 |

| Teacher instructional practice | Moderating variable | Estimated interaction coefficient | Standard error | *p*-value | Analytic sample size |
|---|---|---|---|---|---|
| Classroom disruption | Student White non-Hispanic | -0.056 | (0.09) | 0.55 | 10,610 |
| | Student Black non-Hispanic | 0.067 | (0.09) | 0.45 | 10,610 |
| | Student Hispanic | -0.015 | (0.09) | 0.87 | 10,610 |
| | Student FRPL eligibility | -0.064 | (0.06) | 0.31 | 10,610 |
| | TPP status | -0.108 | (0.11) | 0.32 | 10,610 |
| | School-level racial and ethnic diversity | 0.226 | (0.25) | 0.38 | 10,610 |
| | Student-teacher ratio | 0.011 | (0.01) | 0.30 | 10,610 |
| | Total number of students | -0.000 | (0.00) | 0.64 | 10,610 |
| Observed classroom management | Student White non-Hispanic | 0.052 | (0.08) | 0.54 | 9,234 |
| | Student Black non-Hispanic | 0.003 | (0.09) | 0.98 | 9,234 |
| | Student Hispanic | -0.114 | (0.10) | 0.27 | 9,234 |
| | Student FRPL eligibility | 0.060 | (0.07) | 0.37 | 9,234 |
| | TPP status | 0.050 | (0.11) | 0.65 | 9,234 |
| | School-level racial and ethnic diversity | 0.017 | (0.22) | 0.94 | 9,234 |
| | Student-teacher ratio | 0.012 | (0.02) | 0.55 | 9,234 |
| | Total number of students | 0.000 | (0.00) | 0.97 | 9,234 |
| Self-reported classroom management | Student White non-Hispanic | -0.035 | (0.13) | 0.79 | 10,716 |
| | Student Black non-Hispanic | 0.342* | (0.17) | 0.04 | 10,716 |
| | Student Hispanic | -0.203 | (0.15) | 0.18 | 10,716 |
| | Student FRPL eligibility | 0.023 | (0.08) | 0.78 | 10,716 |
| | TPP status | -0.087 | (0.13) | 0.52 | 10,716 |
| | School-level racial and ethnic diversity | -0.320 | (0.41) | 0.43 | 10,716 |
| | Student-teacher ratio | -0.002 | (0.02) | 0.92 | 10,716 |
| | Total number of students | -0.001 | (0.00) | 0.14 | 10,716 |
| **Overall ELA instructional practices** | | | | | |
| Overall ELA instructional practices | Student White non-Hispanic | -0.009 | (0.01) | 0.30 | 8,365 |
| | Student Black non-Hispanic | -0.000 | (0.01) | 0.98 | 8,365 |
| | Student Hispanic | 0.003 | (0.01) | 0.77 | 8,365 |
| | Student FRPL eligibility | 0.004 | (0.01) | 0.57 | 8,365 |
| | TPP status | 0.002 | (0.02) | 0.93 | 8,365 |
| | School-level racial and ethnic diversity | 0.050* | (0.02) | 0.02 | 8,365 |
| | Student-teacher ratio | 0.001 | (0.00) | 0.38 | 8,365 |
| | Total number of students | -0.000 | (0.00) | 0.05 | 8,365 |

Note:   A separate regression analysis was performed for each teacher instructional practice. Each analysis included the following student-level controls: standardized ELA pretest score, standardized mathematics pretest score, race (White non-Hispanic, Black non-Hispanic, and Hispanic), FRPL eligibility, gender, special education status, and English learner status; the following school-level controls: TPP status, racial and ethnic diversity, student–teacher ratio, total number of students, charter status, number of full-time teachers, and percentage of students eligible for FRPL; as well as teacher novice status. Standard errors are clustered at the school level.

*Statistically significant at the 5 percent level, two-tailed test.
**Statistically significant at the 1 percent level, two-tailed test.

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