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Free to Fail or On-Track to College

Setting the Stage for Academic Challenge: Classroom Control and Student Support

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Summary

This research brief summarizes findings from two studies on high school instruction.[1] These studies suggest that increasing the challenge (rigor) of the curriculum in high schools is unlikely to improve student achievement without concurrent improvements in teachers' abilities around classroom management and academic support; asking students to do more challenging work can have both beneficial and adverse effects, depending on elements of the classroom instructional environment.

Across the country, policymakers are trying to raise the level of academic challenge in high schools to get more students ready for college and careers. Concerns about high school preparation have been voiced since the *Nation at Risk* report in the early 1980s,[2] but the issue has become increasingly prominent as students' educational aspirations have risen dramatically. The vast majority of students in the nation now aspire to attain at least a four-year college degree.[3] Yet, most students graduate from high school without the skills or knowledge expected to be able to succeed in college.[4] International comparisons have further led policymakers to worry about the competitiveness and productivity of American students in the future world economy.[5]

As a result of these concerns, there have been a number of policy initiatives in the last decade aimed at increasing the rigor of the high school curriculum so that more students can access and succeed in postsecondary education. In 2005, the National Governors Association recommended enacting rigorous college preparatory graduation requirements, developing programs to encourage disadvantaged students to take Advanced Placement (AP) exams and college-preparatory classes, and designing literacy and math support courses for students with below-grade level performance.[6] Most recently, 48 states adopted the new Common Core and Next Generation Standards aimed at making high school curriculum and assessments coherently aligned to college-ready levels.[7] Across the country, schools are revising their curricula to meet these new standards and prepare for new standardized tests of these standards, which are due to be implemented in 2015.[8]

There is great optimism that all of the work to increase curricular rigor in high school will lead more students to be ready for the academic demands of college and the technical demands of a twenty-first century economy. Unfortunately, this optimism is based on mixed evidence.

On the one hand, some studies suggest that an emphasis on a college-preparatory curriculum, instead of remediation, improves academic achievement.[9] Evidence from international comparison studies suggests that top-performing countries have curricula with focus, rigor, and coherence, and similar comparisons have been made nationally across states.[10] There is also a great deal of research showing that students who take advanced courses perform better in college than those without advanced coursework.[11]

Curricular Reform Efforts in Chicago

Chicago has been ahead of much of the country in attempting to provide a rigorous, college-preparatory curriculum to all students, as well as in enacting curricular reforms to ensure that struggling students received extra instruction and that content and pedagogy were rigorous and aligned to college-ready standards. Despite the best intentions, prior reforms have not led to the advances in student achievement that were so strongly desired. Here we highlight three policies that seemed to hold great promise for improving college readiness and reducing the achievement gap between students entering high school with weak and strong academic skills.

College-Preparatory Curriculum for All

In 1997, CPS raised its graduation requirements to align with the New Basics Curriculum, with specific course sequences in math and science.[A] Low-end and remedial courses were eliminated. While there is evidence that low-achieving students were exposed to more rigorous material, test scores did not improve, failure rates increased among low-skilled students, and college outcomes declined among high-skilled students.[B]

Double-Dose Algebra

In 2003, in recognition that some students were unable to master the demanding curriculum, the district required an extra algebra support course for students whose eighth-grade test scores were below the national average. Classroom behavior improved and academic demand increased for students in single period algebra classes because low-skilled students were now in separate classes. As a result of better behavior and higher demand, test scores improved. But teacher monitoring and support did not increase, and high-skilled students failed algebra at higher rates.[C] The policy was seen as a failure because it did not lead more students to pass ninth-grade algebra. In fact, algebra failure rates went up with the policy, even though students' math scores improved.

Instructional Development System Curricula

In 2006, CPS embarked on an ambitious transformation of high school instruction, called Instructional Development System (IDS). In this initiative, the district identified vendors of high-quality curriculum with formative assessments aligned with ACT's EPAS system; schools selected one of two English/reading curricula, one of three science curricula, and one of three math curricula. Each curriculum came with materials, peripherals, common assessments, and professional development and coaching for teachers. The goals were to develop core curriculum materials in English, mathematics, and science and to transform high school instruction in those subjects.[D] The new materials included specific unit-by-unit guides for teachers with clear goals and targets for each unit, model lessons, summative and diagnostic assessments, guides for professional development for teachers to use these materials, and intensive classroom-based coaching.

While there is evidence that the challenge of instruction and the instructional support that teachers received improved in the first year, these improvements were not sustained in the long term. Observations of classrooms showed that many teachers struggled to implement the curriculum due to behavioral problems, and disruptions increased after implementing the more challenging new curriculum. Grades did not improve, while test scores significantly declined.[E]

On the other hand, there is little evidence that mandating more demanding work for all students will lead to higher educational attainment overall. Most studies that link student achievement to academic demands do not fully correct selection bias; there may be differences in factors such as motivation among students and capability among teachers who experience high-level classes.[12] International and national comparisons do not fully account for contextual differences and historical reasons why countries have different curricula (Raudenbush and Kim, 2002).

In Chicago, a long history of efforts to increase instructional rigor through major policy initiatives has had disappointing results. A number of policies succeeded at increasing the academic demands, but did not bring improvements in academic achievement. In fact, there were adverse consequences on educational attainment. The inset box, *Curricular Reform Efforts in Chicago*, describes what happened. These past efforts call for caution amidst the current enthusiasm for increasing curricular rigor. They also provide important lessons for school practitioners to consider so current efforts to increase curricular rigor will have a positive impact on student achievement. This research brief summarizes findings from two studies on high school instruction — one quantitative and one qualitative — which examined the link between students' experiences with classroom instruction and their academic outcomes. These studies show how academic challenge, classroom control, and academic support interact with each other to influence students' academic outcomes.

Academic Challenge Is Only One of Many Important Elements of Classroom Instruction

As educators work to implement the new common curriculum standards, much of their effort focuses on developing new lesson plans, planning for new assessments, and aligning instructional content across classes and grade levels. The focus of teachers' preparation around the new curriculum will naturally be on what is taught and how it is taught — content and pedagogy. However, academic challenge is only one of several important elements in classroom instruction, and the effects of changing the curriculum and standards on students' achievement may depend on what happens concurrently with these other elements of classroom instruction.

While research has shown a number of discrete aspects of classroom instruction have significant relationships with student learning, the effects that have been found are often small and inconsistent across studies, grade levels, types of pupils, and academic subjects (Rowan, Correnti, and Miller, 2002; Camburn and Won-Han, 2011). This suggests it is not just one element of instruction—such as academic demands—that matters for student outcomes, but the combination of different elements. Studies that have examined multiple elements of instruction simultaneously have shown larger effects than those of individual elements alone. For example, content coverage, when combined with cognitive demands, has a stronger association with achievement gains than when considered in isolation (Gamoran, et al., 1997; Porter, 2002). Lee and Smith (1999) studied two elements taken together—academic demand and social support—and found academic demand together with social support produced larger gains in test scores among elementary students than either alone.

To understand how students' instructional experiences were related to their academic outcomes, we compared what they and their teachers said was happening in their classes to the grades they received and their test score gains. Students and teachers were surveyed in high schools throughout the city of Chicago. (**See "*How We Studied Instruction*," and the Appendix** for details about the surveys and method for studying student achievement.)

These surveys allow us to examine the ways in which elements of classroom instruction

How We Studied Instruction

Information on classroom instruction comes from two sources: 1) surveys of students and teachers in 98 Chicago high schools; and 2) observations of eighth- and ninth-grade classrooms in nine neighborhood schools in Chicago, along with interviews of teachers and students in those classes.

Information on the surveys and the questions used to measure classroom instruction are provided in the Appendix, along with information about analytic methods for linking measures of classroom instruction to gains in students' test scores and grades.

Survey Data from the Curriculum Study

About half of all high school students and teachers in the Chicago Public Schools participated in the survey in spring 2009; this was 4,359 teachers and 58,571 students in grades 9-12. The surveys asked students and teachers about their experiences in specific classes. Through these surveys, we examined many different elements of classroom instruction, how those elements cluster in different classrooms, and how each is related to student achievement. Classroom instructional measures were then used to predict test gains and grades of the students in each class, controlling for their prior academic performance.

Classroom Observations and Interviews From the Focus on Freshmen Study

We supplement the survey analysis with case studies of eighth- and ninth-grade math and English classrooms, conducted in the 2007-08 and 2008-09 school years. We draw a few cases for this brief from a total of 109 observations conducted. The majority of classes were observed twice, once in the fall and again in the spring. After each observation, the teacher was interviewed about the class. The classes were chosen based on a sample of students who were interviewed about their classes twice in their eighth-grade year and four times in the ninth grade. Further information about the qualitative data is available in the Appendix.

influence student achievement and how these elements cluster in different classrooms. They also provide a snapshot of the state of instruction in many CPS classrooms in 2009. Since that time, the district and the state have initiated efforts to try to improve the quality of instruction, and it is worth noting that this survey predates the implementation of both the REACH Teacher Evaluation System and the Common Core.

More information on the analysis of surveys of classroom instructional environment is available in the report, *Classroom Instructional Environments in Chicago High Schools: Implications for Effectively Improving Course Rigor and Student Achievement in an Urban School District* at ccsr.uchicago.edu/publications.

We examined many different elements of classroom instruction in high schools—such as teacher expectations, quality of classroom discussions, orderly student behavior, instructional clarity, and teacher monitoring and support—to see how they clustered in different classrooms. A description of all measures of classroom instruction is provided in the Appendix box, ***"Measures of Instruction from Surveys of Students and Teachers"* on p.21** In general, classrooms could be classified based on three distinct dimensions:

- **Academic Challenge**—including measures of academic demand, critical thinking in assignments, and teachers' expectations (as reported by students and teachers)
- **Classroom Control**—including reports of student behavior, orderliness, participation, and work completion (as reported by students and teachers)
- **Academic Support**—including teachers' monitoring and support, responsiveness, and instructional clarity (as reported by students)

Each dimension emerged as important for student achievement but not in the same ways for all outcomes. In the figures that follow, we highlight specific measures from the three dimensions to show the relationship of each dimension to student achievement. To show the relationship of challenge to test scores, we use a report of students' perception of academic challenge in their class. For classroom control, we use a measure of student behavior; and for academic support, we use a measure of teacher's monitoring and support. The other measures of instruction that clustered in these dimensions show the same general relationships.[13]

KEY FINDINGS:

Academic Challenge

Two dimensions of instruction emerge as having the strongest relationship with test gains—academic challenge and classroom control. In classrooms that are controlled, students are doing what their teacher asks of them—coming to class, participating, and getting their work done. Controlled, orderly classrooms are not necessarily "quiet" classrooms, but they are places where student behavior is closely aligned with teachers' expectations. Challenging classrooms are ones in which students report the work is difficult and requires significant effort in order to do well.

Students Learn the Most in Classrooms That Are Both Very Orderly and Challenging

Students in Chicago participate in the EPAS system, which includes the EXPLORE exam at the beginning of ninth grade, the PLAN exam at the beginning of tenth grade, and the ACT at the end of eleventh grade.[14] In classrooms that are very controlled and also have challenging instruction, gains on ACT's EPAS system from the PLAN to the ACT are 0.92 points higher than classrooms that are average in terms of challenge and order (**see Figure 1**).[15] On the EPAS system, the typical CPS student gains just 1 point per year; therefore, a gain of 1.92 points is almost twice as high as average.

Measures of good classroom control and challenge are the strongest predictors of learning gains. This is consistent with findings in another recent study that used student surveys to measure classroom instruction at the middle grade level—the Gates' Foundation MET extension survey. That study also found that measures of student behavior and measures of challenge were the strongest predictors of value-added scores on standardized tests, and that the combination of class control and challenge most strongly predicted gains.[16] This makes sense, because students cannot learn if they are not doing the work that teachers expect them to do.

ACADEMIC CHALLENGE as used in Figure 1 was measured from two questions on the student survey:

In this class, how often:

- Are you challenged?
- Do you have to work hard to do well?

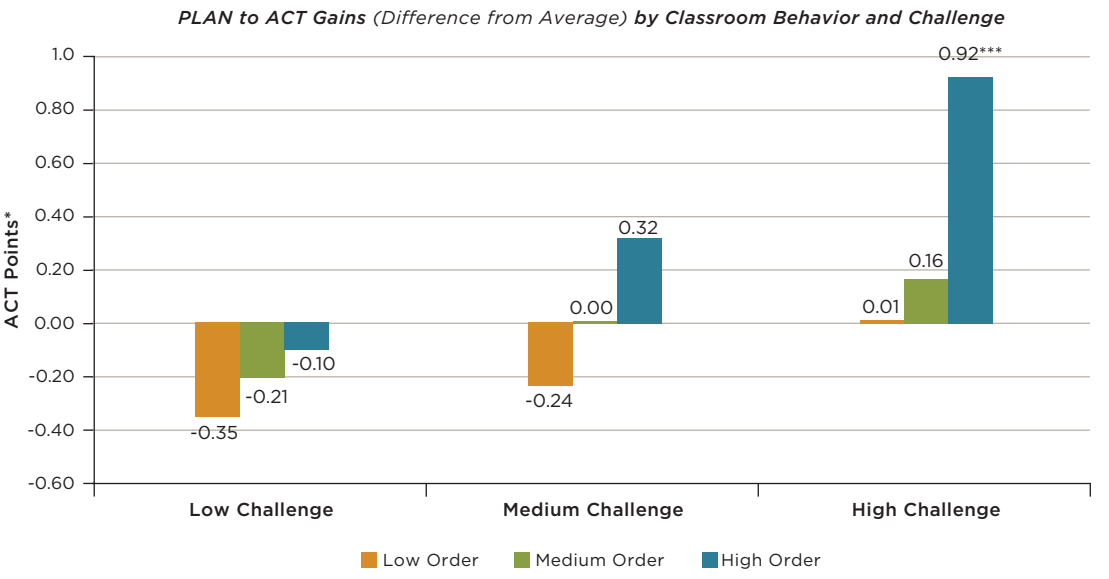
ORDERLY STUDENT BEHAVIOR as used in Figure 1 was measured from three questions on the student survey:

How much do you agree with the following statements about this class:

- I get distracted from my work by other students acting out in this class.
- This class gets out of control.
- My classmates do not behave the way my teacher wants them to.

FIGURE 1

Students learn the most in classrooms that are both orderly and challenging



Note: *** Indicates that gains are significantly higher than gains in medium order, medium challenge classrooms, at p<.001. Test score gains are adjusted to take into account differences in student background characteristics including race, gender, neighborhood poverty, neighborhood socioeconomic status, special education status and prior test scores.

In Disorderly Classrooms, Students Do Not Learn Much Even if the Academic Demands Are High

As shown by the orange bars in **Figure 1**, even when students report a high level of challenge in disorderly classrooms, learning gains are barely above average. In fact, students learn more in orderly classrooms with average demands than in disorderly classrooms with high demands. This is not just a matter of students perceiving the class to be challenging because it is disorganized. The teacher survey asks objective questions about the types of work expected of students, and the same pattern occurs when we examine teachers' reports about classroom demands and student behavior. Likewise, similar relationships can be seen with different measures of academic challenge from the student surveys. (**See the complete list of survey measures in the Appendix box, "*Measures of Instruction from Surveys of Students and Teachers.*" on p.21**) Similar patterns are also observed in gains from the ninth-grade EXPLORE exam to the tenth-grade PLAN.

Without academic challenge, students do not learn much even if the classroom is orderly. **Figure 1** also shows that classrooms that are very orderly—where students are doing the work that is expected—but are very unchallenging also show below-average learning gains. Regardless of the level of order in the classroom, classes where students report low levels of academic challenge show below-average gains on the EPAS.

Classroom Control

Order Is Harder to Maintain When Work Becomes More Challenging, Particularly in Classrooms with Low-Achieving Students

When teachers ask students to do work that is challenging, students will struggle at first. By definition, challenging work is not easy. In a classroom with high-achieving students who

have a history of succeeding in school, and for whom academic success tends to come easily, teachers may not need exceptional skills to get students to work hard and do difficult work; these students have been successful in the past and have learned that hard work pays off. But the more that classrooms have students who are struggling with the class demands, and who have had histories of failure, the more difficult it is to motivate students to put in substantial effort, and provide sufficient support so they can be successful. Research on student motivation and work effort shows that students work hard when they believe their effort will pay off for them, and they can be successful.[17]

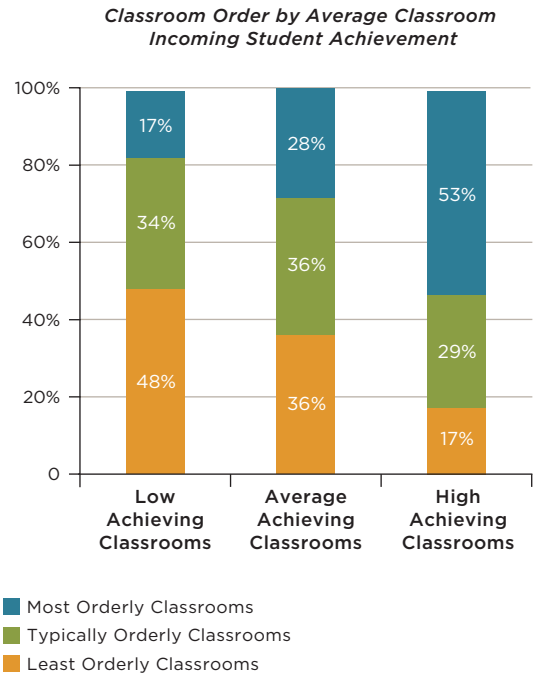
Student engagement is highest when there is a match between the challenge provided by the activity and an individual's ability. The challenge required by classroom activities must match the skill level of students and not be either too easy or simply too overwhelming for the student.[18] Thus, for students to maintain effort, they need to believe that they can be successful when the work gets hard.

Teachers in classrooms that have low-skilled students may have a hard time getting students to engage in challenging work—work with which they will struggle simply because it is demanding. As a result, students may act out as a way of expressing their frustration toward work that feels too hard. We can see this in the very strong relationship between classroom order and the incoming test scores of students in the class. It is very rare for a class of high-skilled students to be disorderly, while it is common for classes with low-skilled students to struggle with interruptions and low student engagement. As shown in **Figure 2**, nearly half of all low-achieving classes are disorderly; these are "out of control" classrooms in which students are easily distracted because their peers are acting out. (**See box on the bottom of p.5** for a description of the items measuring classroom order.) In contrast, less than 20 percent of high-achieving classes have poor classroom control. In fact, just over half of high-achieving classes have very orderly classroom environments, where instruction is never or rarely interrupted and student behavior is aligned with teachers' expectations. Very orderly classroom environments are rare in low-achieving classes—fewer than one-fifth can be classified as very orderly (**see Figure 2**). The same pattern can be seen using teachers' reports of classroom behavior, rather than student reports.[19]

This is not just because new teachers, who may be less skilled in classroom control, tend to be assigned to the lower-level classes. In Chicago, a policy that resulted in splitting up classes by

FIGURE 2

Classes of low-achieving students are much more likely to have poor classroom control than classes of high-achieving students



Note: Classroom order was measured from students' responses to three items on the CCSR survey: *How much do you agree with the following statements about this class: 1) I get distracted from my work by other students acting out in this class. 2) This class gets out of control. 3) My classmates do not behave the way my teacher wants them to.*

Classrooms were then ranked into three equal groups. Classrooms were also ranked into three equal groups based on students scores on the 9th grade EXPLORE test.

ability level had the consequence of lowering the percentage of students with behavioral problems in the classes attended by high-achieving students and increasing the percentage of students with behavioral problems in the classes attended by low-achieving students.[20]

As classes get more difficult, and students feel frustrated, they often disengage and withdraw effort.[21] This pattern could be seen over and over in the sample of students we followed throughout the transition to high school. For example, one ninth-grade student described how her math class started out easy but, by the second half of the semester, *"it got harder because we started learning things that I didn't even know."* As the class difficulty increased, she stopped doing work and her grades dropped:

> I kind of lost interest in schoolwork and having to do it over....They were teaching things I didn't know and whenever I asked, I still didn't understand the thing, so I just didn't do anything pretty much. [I stopped doing] my homework. I didn't understand it.

Classroom observations often recorded teachers struggling to get students to do challenging work. In a number of classrooms, teachers were asking their students to do challenging student-centered work during the fall observations but were thwarted by poor student behavior. When we observed their classes again in the spring, they had reverted to more teacher-centered forms of instruction with less challenging tasks for students. Ms. Wallace's classroom (**see Ms. Wallace's Classroom Case Study**) is a typical example.

Teachers need strong plans around motivating and supporting student effort the more that they expect students to engage in challenging work. When teachers ask students to do more difficult work, or more student-centered work, than they are used to doing, students may not understand the new behavioral expectations. If students will need to study more with the new expectations, or study differently, then teachers may need to model those new studying behaviors and be explicit about the time it will take to do the work. Students also may need more individual assistance if their skill levels are below the skill levels expected for the course. Teachers may need additional support from other staff, especially if there are many students who enter with skill levels far below the skill level of the class they are teaching.

Academic Support

Academic Challenge Can Lead to Lower Grades, Unless Accompanied by Sufficient Support

Academic challenge is essential for learning and showing improvements on test scores. But a substantial body of research shows that students' high school grades and pass rates are much more important than their test scores for both high school and college completion.[22] Unfortunately,

MONITORING AND SUPPORT was measured from seven questions on the CCSR student survey:

How much do you agree with the following statements about this class? The teacher for this class...

- Notices if I have trouble learning something
- Really listens to what I have to say
- Helps me catch up if I am behind
- Will help me improve my work if I do poorly on an assignment
- Gives me specific suggestions about how I can improve my work in this class
- Explains things a different way if I don't understand something in class
- Is willing to give extra help on schoolwork if I need it

MS. WALLACE'S[23] CLASSROOM: A CASE STUDY

Attempts to Implement More Demanding Curriculum Can Be Undermined by Problems With Student Behavior

This case study comes from fall and spring observations and teacher interviews that were collected as part of the Focus on Freshmen study. Further information about how we analyzed and coded the observations is available in the back of this brief.

Fifth-period algebra at Ontario High School[24] started out as an academically challenging class. In the first part of the year, students were asked to complete academically challenging activities that required them to make connections between procedures and the underlying mathematical concepts. These activities involved a higher level of cognitive demand than the activities found in most other ninth-grade algebra classrooms in similar neighborhood schools in the Focus on Freshman study.[25] In spite of Ms. Wallace's desire to provide students with challenging work, the class was plagued by problematic student behavior. According to Ms. Wallace, the problematic student behavior detracted from what she was able to accomplish. This ultimately led Ms. Wallace to decrease the level of challenge and revert to teaching through teacher-led instruction.

In the vast majority of the ninth-grade algebra classes that we observed, teachers asked students to perform equation after equation without making connections to underlying mathematical concepts, meaning, or understanding (e.g., lists of problems solving equations such as $y = mx + b$). In Ms. Wallace's class, students were asked to figure out a solution to a concrete problem and then to represent the solution with an equation.[26] During the course of the lesson, however, problematic student behavior severely limited the amount of teaching and learning that took place. Throughout the period, the lesson was intermittently interrupted by students engaging in eating, singing, yelling out, putting their heads down, and asking to go to other classes to collect money. This can be seen in an excerpt from one classroom observation:

Ms. Wallace moves over to a female student, squats down, and begins explaining how to do number 1. At least five students are not doing anything. A female student sits with her head down during most of the class. A male student, who asked to go see another teacher to get his money from her, puts his head down on his desk and neither contributes nor engages in the class after the money discussion. Ms. Wallace moves back to the front of the classroom and says, *"Did everyone get it?"* She then turns to two female students and yells, *"Ladies, take those earphones out! No iPods!"* Ms. Wallace then asks the class to begin working on the next problem.

These types of student behaviors detracted from the academic task at hand, making it difficult for students to engage in learning and for

Ms. Wallace to teach effectively. According to Ms. Wallace, Ontario High School's challenging ninth-grade algebra curriculum was supposed to be taught in an interactive, engaging way that involved students working in groups, doing presentations, and discussing math. *"That didn't work for this particular class,"* however, due to the students' low levels of math skills and problematic behavior. Ms. Wallace went on to say:

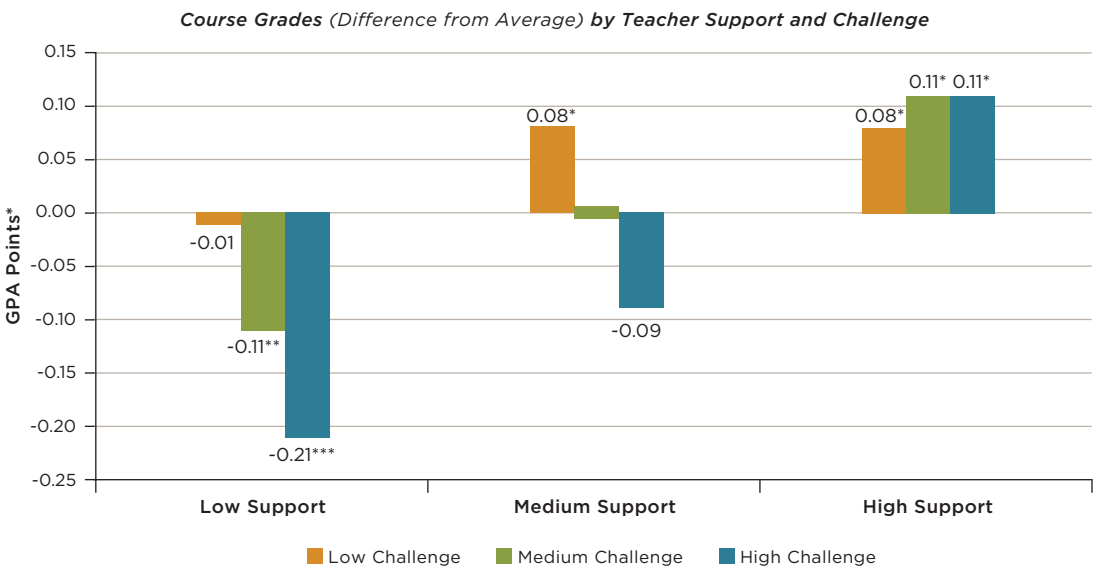
> "[The students] weren't ready for that discussion of math because many of them didn't come with anything to discuss so if you have nothing to discuss about math, you can't get in a group and actually add anything to it....We tried groups for many [of the activities], but this is a class where I had to just put them in pairs and... I had to do a lot of direct instruction.... And then I had discipline problems so I had to find a way to not have as many discipline problems but get people to move, so I had to go against the grain of how they wanted me to implement [the curriculum]....I had to keep it very, very structured for [the students]."

This altering of the curriculum and instruction described by Ms. Wallace could be seen during an observation of her fifth-period algebra class in late March. During the period, Ms. Wallace led a class discussion on identifying the slope of an equation; how to figure out if two lines are parallel or if they cross; and systems that have infinite solutions. Compared to the activity used in the class three months earlier, this activity demanded less active engagement from students—students responded to the teacher's questions without having to problem-solve on their own. It was also more abstract, since there was little or no connection to broader concepts or real world applications. Thus, due to her frustration with students' lack of academic and study skills and their poor classroom behavior, Ms. Wallace reverted to teaching her students using direct instruction—a less engaging and challenging pedagogy than called for by the curriculum.

Ultimately, in spite of the challenging, interactive curriculum they were initially exposed to, the students in Ms. Wallace's fifth-period algebra class had lower math test score gains and received lower grades in math than other CPS students with similar backgrounds and characteristics.[27] The intention to implement strong academic demands with engaging pedagogy did not lead to higher levels of teaching and learning; rather, the strong demands were undermined by poor student behavior to create a weak classroom instructional environment.

FIGURE 3

High teacher support is necessary for students to do well in challenging courses



*Relationships are from statistical models which control for student background characteristics (race, gender, SES, special education status, eighth-grade test scores) and course subject (math, science, English, or social studies). Course grades are significantly different than in classrooms that have average challenge and support at: *p<.05, **p<.01, ***p<.001.

as discussed in detail below, increasing challenge raises the risk that students will fail and receive low grades (**see Figure 3**). Grades do not decline, however, if teachers provide more monitoring and support when asking students to do more difficult work. Teachers can provide support by giving clear instructions and explaining things in multiple ways, keeping up with feedback on assignments and letting students know where their grade stands at all times, and closely monitoring students' performance and reaching out to help them as soon as they fall behind.

Students Need More Support as Work Gets More Challenging

If coursework is easy, it does not take much effort to pass the class and it may not take much effort to get a high grade. But as work becomes more demanding, students withdraw effort if they do not understand what is going on or do not know how to catch up. As a result of not getting the work done, their grades drop. **Figure 3** shows the relationship between the challenge of instruction in a classroom, and students' grades, given the degree of support that students receive from teachers. For students who receive only low or medium teacher support, grades are lower the more students are asked to do challenging work.

With Sufficient Support, Students' Grades Do Not Drop in Challenging Classes

The lowest grades are in those classes where students are given challenging assignments and little support. But not all challenging classes have below-average grades. In classrooms where students report high levels of teacher support, grades are above average regardless of the level of challenge. In fact, grades are actually higher in challenging classrooms with high levels of support than in classrooms where the work is easier but teachers provide little support.

Prior UChicago CCSR research has shown that ninth-grade pass rates, grades, and student attendance are better at schools where students

report high levels of trust with their teachers and where teachers provide support and monitoring.[28] From interviews with students, we can understand why this is so. As described in the research brief, *Strong Student-Teacher Relationships Mean Supporting Students as Learners*,[29] sustaining and improving students' effort and grades requires close monitoring and immediate assistance when students start to struggle. When students are having problems keeping up with work and their teachers reach out to help them, they interpret that help as caring about them. When students are struggling and nobody helps them, they see their teacher as unfair. In general, students describe teachers who care and support them as those who: 1) explain material clearly in multiple ways; 2) monitor their performance closely and give them frequent feedback; and 3) provide individualized assistance when they need it.[30] Teachers cannot wait for students to approach them, because many students never ask for help, even when they need it. The sooner that teachers reach out when a student falls behind, the easier it is to help the student catch up.[31]

Providing academic support is a key element to keeping students engaged in classrooms because it makes them believe they can be successful. Students need to believe they can succeed; otherwise, there is no reason to put in effort. There is a long line of research on self-efficacy that shows the more that students feel like they can do the work, the more likely they are to put in effort.[32] When they are putting in effort and working hard, they are likely to get good grades and show gains in learning.

The case studies on the following pages provide two illustrations of classrooms with different levels of academic support. The first case, the classroom of Ms. Lee, describes how students feel successful in their learning when they receive the necessary supports to match academic demands. The contrasting case of Mr. Gibbs's classroom shows how a lack of support can lead to students putting in minimal effort and receiving lower grades than students entering ninth grade with similar skills and backgrounds.

Implications

Teachers Need Time, Resources, and Training to Address Additional Instructional Demands that Arise from Implementing More Challenging Instruction

As school districts get ready to implement the new Common Core and Next Generation Standards, there is a general understanding that there will be a need to increase teachers' content knowledge of the subjects they teach. But increasing rigor asks much more of teachers than changing content or pedagogy. Teachers will need to be successful at getting students to do the challenging work, and provide additional monitoring and support, if the efforts to increase curricular rigor are to pay off with higher student achievement and educational attainment. Too often, rigor and student engagement go in opposite directions—teachers engage students by making the course fun at the expense of being challenging, or they make a course challenging at the expense of student interest and self-efficacy. It takes substantial pedagogical skill to do both.

It takes motivation to do hard work. Improving student learning requires as much attention to student behavior as to the challenge of the curriculum.

- Attention to student behavior does not mean that teachers should focus on behavior instead of rigor. Rather, teachers need to anticipate the difficulties that can arise from student frustration, student withdrawal, and classroom disruption when they expect more of students with challenging work.
- As teachers ask more of students, they will need strategies to increase students' effort so that they are successful at the more

MS. LEE'S AND MR. GIBBS'S CLASSROOMS: A CASE STUDY

Students Need Support to Match Academic Demands: The Contrasting Cases of Two Classrooms

Ms. Lee's algebra class and Mr. Gibbs's algebra class appeared to have a lot in common: their classes had students with similar backgrounds and incoming test scores, they covered similar content, and both classes were orderly with students by and large participating in class. Yet, the classes diverged in the clarity of instruction and level of academic support provided by the teachers.

Ms. Lee provided clear explanations of the content, gave individualized help to students, monitored students' progress, and provided them feedback on how they were doing in class. Mr. Gibbs went through the material quickly and did not provide clear explanations or individualized support to students.

One way in which Ms. Lee provided academic support for her students was by explaining concepts in multiple ways that were understandable and connected to students' real-world experiences. Kayla, one student in the class, said, *"[Ms. Lee's] method of teaching is very easy.…She goes step by step. She gives the definition, and then she explains and gives us a couple times to go through it."* Ms. Lee consistently tried to connect abstract concepts to concrete aspects in students' lives. Ms. Lee's teaching style piqued students' interest and kept them engaged in the work. One student said he enjoyed the class *"[because Ms. Lee] actually teaches well, not like the other teachers that make it kind of boring.…She actually makes it fun."*

Another way Ms. Lee supported her students academically was by providing them with individualized attention and assistance. Ms. Lee tried to accomplish this through circulating and individually assisting students in class. A student in the class noted that, after explaining a concept to the class, *"[Ms. Lee] walks around the class and goes to every group…[and] explains everything. And if you don't get it again, she'll…explain it again."* In addition to circulating among students and checking for comprehension, Ms. Lee created a classroom environment in which students also felt comfortable approaching Ms. Lee for help.

Students also valued the high level of monitoring and feedback that Ms. Lee provided for them. Ms. Lee periodically gave students a list of what assignments were due when and how many points each assignment was worth. Students also noted that Ms. Lee was one of the few teachers who was explicit about how she calculated students' grades. They appreciated her system of posting her grading rubric on the back wall of the classroom listing the proportion of the students' grades that different components (homework and quizzes) were worth. Ms. Lee also reported working to encourage good attendance and following up with students who were falling behind. She said, *"I…try to [use] every…avenue [I can to reach the students]—pulling them out during lunch [to make up work], sending them reminders…[calling their] parents, and…*

[letting them] know, 'Hey, all of us teachers know that you're failing this class, and you need to get your work together.'" According to Ms. Lee, providing structure and feedback to students led them to take more ownership and responsibility in their learning.

In contrast to students in Ms. Lee's class, those in Mr. Gibbs's class lacked academic support. Mr. Gibbs did not explain concepts clearly or thoroughly enough for the students. According to one of the students in the class, *"[Mr. Gibbs] just puts [the work] on the board and says, 'Do the problems....'"* An external observer reported only one instance during Mr. Gibbs's 46-minute period in which he went over a problem with a student one-on-one. According to a student in the class who initially thought the class was easy but found it to be progressively more difficult, *"[The class has] been getting difficult, but [Mr. Gibbs] doesn't explain nothing, so that class is really...crazy."* Mr. Gibbs reported that he had not successfully accomplished his goals for the class of having his students prepared for geometry and trigonometry because a number of the students were not motivated to do well. Mr. Gibbs implicitly felt it was the students' responsibility to learn how he taught and not up to him to reach out to students. He stated, *"No matter how I set up a lesson, if you don't bring a pencil, you know, I don't know what I can do for you."* As a point of comparison, Ms. Lee also noted she often had to provide pencils since *"that's the number one thing that they never bring,"* but did not allow that to get in the way of teaching her students.

Ultimately, in spite of how they seemed on the surface, Ms. Lee's and Mr. Gibbs's classes were significantly different in the levels of academic supports provided to students. The clear explanations with multiple examples, individualized assistance, and monitoring and feedback that Ms. Lee provided helped her students to achieve academically and receive significantly higher grades and test scores than typical for students with similar backgrounds and entering test scores. While Mr. Gibbs's students had average learning gains, their grades were significantly lower than typical.[33]

difficult, time-consuming tasks. Teachers may need support around classroom management strategies that encourage and support student engagement. This includes designing lessons in ways that build positive mindsets about the work. For example, students are motivated to work hard when they believe they can be successful, and that there is value in the work they are doing.

- If students are being asked to do work that is more challenging than what they have done previously, they may not fully understand how their behaviors need to change to handle that challenging work. Teachers may need to be explicit with students about having to study more, or give them strategies to keep up with homework, teach them how work independently, and model the types of behaviors they expect.

Monitoring and support can make a difference in sustaining students' grades and making it more likely they will pass:

- Students appreciate it when teachers recognize their need for help and are willing to give assistance until they understand the material. Students interpret this assistance as meaning that the teacher cares about them as learners.
- Often, students do not realize they are doing poorly in their classes until it is too late. Having clear grading systems so that students always know where they stand and realize when their grade has fallen allows students to monitor their own performance, making it easier for teachers to know when students need help. This includes keeping up with grades and keeping an ongoing calculation of where students' grades stand. Keeping up grades in the online gradebook system and communicating with parents about student progress also allows parents to be partners with teachers in monitoring students' performance so that students can get support before they fall too far behind to catch up.
- Students frequently skip class and get behind on homework, especially when they are struggling. Some schools have policies of contacting parents after a student has missed two weeks of class. But a student who has missed two weeks of class is very far behind and has a high probability of failing. Calling home right away when a student misses just one or two days of class, or misses one or two assignments, has multiple benefits. It is easier to make plans for making up work when a student has missed only a few days of class or a couple of assignments. It can also help establish a partnership with parents around supporting students as learners before it is too late to be likely to have any effect. While there is more work for teachers upfront, students get the message early on that they can not skip class or put off work.

Schools can develop systems to help teachers support students, especially if they are teaching students with below-average skills.

- The more teachers try to implement curriculum that is difficult for the students, the harder their job becomes. Students who have not been successful in their classes in the past may be especially difficult to motivate around challenging material. Successfully implementing difficult work requires more work and more skill from teachers around classroom management and student support. If the bulk of teachers' professional development and planning around new standards is focused only on curriculum content and pedagogy, the curriculum may fall flat in terms of student outcomes—even if teachers adhere tightly to the new standards.
- Teachers in classes with many low-achieving students are especially likely to struggle when implementing challenging work. They need more resources and expertise than teachers in high-achieving classrooms to engage

students in work and provide them adequate support. Yet, in many school districts, it is the newest teachers who are most likely to be assigned to low-achieving students while experienced teachers are assigned more often to high-achieving students. [34] Classroom management is an area in which many novice teachers struggle, especially compared to experienced teachers. [35] Implementing challenging work equally for all students may require an unequal distribution of resources—with the most experienced teachers and more supports available to classrooms with the lowest-achieving students.

- Schools systems and collaboration can support teachers to support students. High school teachers typically have 100 or more students they need to monitor. It is easy to lose track of some students while reaching out to help others. And some teachers are not effective at engaging students who are not completing their work. Many schools have developed structures that support teachers in monitoring and supporting students, from teacher teams to on-track coordinators.

Successfully graduating all students from high school at college-ready levels is a task that has never been done before—in Chicago, statewide in Illinois, or across the country. Meeting the goal of college readiness for all students will take dramatic changes in educational practice. Rigorous standards and work on curriculum is a first step, but improvements in educational attainment require substantial changes in instructional practice beyond increasing instructional rigor. Otherwise, increasing the challenge of the curriculum may have no positive consequences for students' educational attainment, and even bring declines. It is the combination of challenging work together with greater attention to classroom control and student support that leads students to gain the knowledge and skills necessary for success in college and the workplace.

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Appendix

Research Methods

Measures of Instruction from Surveys of Students and Teachers

UChicago CCSR administers surveys to students, teachers, and principals in Chicago Public Schools in the spring of each year. Surveys administered in grades 9-12 ask teachers and students a number of questions about what is happening in a specific (target) classroom. Responses are then combined into measures of the instructional elements, which are examined for reliability and internal validity. Details about the CCSR surveys and our methods for analyzing survey data can be found at the CCSR website: http://ccsr.uchicago.edu/surveys. Below we summarize each measure and show how it clusters with others in terms of challenge, student behavior, and support—the three dimensions that emerged from examining patterns among the measures of classroom instruction.[F] We also examined measures of subject-specific pedagogy in math, English, and science, which are not discussed here.

The measures used for **Figures 1 and 2** were academic challenge, orderly student behavior, and teacher monitoring and support; these represented the dimensions of challenge, control, and support, but similar patterns with outcomes are also seen with other measures of those three dimensions. The other measures are described below, along with descriptions of the measures used for Figures 1 and 2. All of the measures have high reliability at the individual and classroom levels.

We also replicated the analyses using teacher survey responses about their classes. However, because teachers were not asked about support, only two dimensions were discerned from the teacher surveys—classroom control and academic challenge. These showed the same relationships with learning gains as those seen with the measures from the student surveys. The most important element was classroom control, with challenge not associated with test gains in disorderly classrooms. The strongest gains were in classrooms with strong order and high levels of challenge.

Academic Challenge

Three elements of classroom instruction fell clearly into the category of academic challenge:

Academic Challenge measures how often students feel challenge and have to work hard to do well. (Reliability = 0.74)

In this class, how often:

- Are you challenged?
- Do you have to work hard to do well?

(Never, once in a while, most of the time, all the time)

Critical Thinking captures the degree to which teachers push students to be better thinkers, require them to explain their answers, and connect learning to life outside the classroom. (Reliability = 0.75)

How much do you agree with the following statements about this class?

- The teacher for this class often connects what I am learning to life outside the classroom.
- The teacher for this class often requires me to explain my answers.
- The teacher for this class wants us to become better thinkers, not just memorize things.

(Strongly Disagree, Disagree, Agree, Strongly Agree)

Teacher Expectations measures the degree to which the teacher expects everyone in the class to do well. (Reliability = 0.76)

How much do you agree with the following statements about this class?

- The teacher for this class expects everyone to work hard.
- The teacher for this class expects me to do my best all the time.

(Strongly Disagree, Disagree, Agree, Strongly Agree)

Academic Challenge and Classroom Control (Student Behavior)

Two measures of classroom instruction were correlated with both challenge and control. They spanned both categories because they are affected by the challenge of the work that is asked of students and by the degree to which students actually engage in the work that is asked of them:

Quality of Student Discussions examines the extent to which students have meaningful classroom discussions by building off others' ideas, examining different points of view, and making connections to past learning. (Reliability = 0.84)

To what extent do the following occur during class sessions?

- We build off each others' ideas.
- We talk about different solutions or points of view.
- Our discussions connect what we're learning to things we've studied in the past.
- If someone makes an incorrect statement, it gets corrected.

(Very little, some, quite a bit, a great deal)

Time on Homework is the number of hours each day that students spend on homework.

On a typical day, how much time do you spend studying or doing homework for this class, outside of class time?

(None, less than 30 minutes, 30-60 minutes, 1-2 hours, more than 2 hours)

Classroom Control / Student Behavior

One measure fell only into the category of student behavior from the student surveys:

Orderly Student Behavior measures the extent to which classrooms are out of control, whether student behavior is misaligned with teachers' expectations, and whether students are distracted by their peers' behavior. (Reliability = 0.80)

How much do you agree with the following statements about this class?

- I get distracted from my work by other students acting out in class.
- This class gets out of control.
- My classmates do not behave the way my teacher wants them to.

(Strongly Agree, Agree, Disagree, Strongly Disagree)

Another measure, **Student Interest**, could also be considered as an indicator of student behavior. It measures how interested students are in the class. However, student engagement could be considered an outcome of a high-quality instructional environment, as well as a quality of the instructional environment. (Reliability = 0.71)

How much do you agree with the following statements about this class?

- Sometimes I get so interested in my work I don't want to stop.
- I usually look forward to this class.

(Strongly Disagree, Disagree, Agree, Strongly Agree)

Academic Support

Three elements of classroom instruction fell into the category of Academic Support.

Teacher Monitoring and Support measures how much teachers are aware of students' academic needs and provide them with the support they need. (Reliability = 0.91)

How much do you agree with the following statements about this class?

- The teacher for this class notices if I have trouble learning something.
- The teacher for this class really listens to what I have to say.

- The teacher for this class helps me catch up if I am behind.
- The teacher for this class will help me improve my work if I do poorly on an assignment.
- The teacher for this class gives me specific suggestions about how I can improve my work in this class.
- The teacher for this class explains things a different way if I don't understand something in class.
- The teacher for this class is willing to give extra help on schoolwork if I need it.

(Strongly Disagree, Disagree, Agree, Strongly Agree)

Instructional Clarity measures the degree to which teachers provide clear learning goals and instruction that supports achievement. (Reliability = 0.71)

How much do you agree with the following statements about this class?

- The homework assignments help me learn the course material.
- The work we do in class is good preparation for the test.
- It is clear what I need to do to get a good grade.

(Strongly Disagree, Disagree, Agree, Strongly Agree)

Caring and Fairness captures the degree to which relationships between teachers and students are caring and fair. (Reliability = 0.70)

How much do you agree with the following statements about this class?

- The teacher in this class really cares about me.
- The teacher in this class applies the rules to all students equally.

(Strongly Disagree, Disagree, Agree, Strongly Agree)

Teacher Surveys

Through teacher surveys we collect information on the types of assignments teachers are giving to students, and how their students are responding to those efforts. The following measures of classroom instruction capture the dimensions of academic demands and student behavior. We do not ask teachers questions about monitoring and support.

Academic Challenge

Assignment demands and Feedback captures the extent to which teachers engage target-class students in writing assignments and provide feedback on these assignments to the students. A high score indicates more demanding assignments. (Reliability = 0.52)

How often are students required to complete...

- Short writing assignments of 1 or 2 pages?
- Revision of assignments after feedback and corrections?

Critical thinking in assignments examines the degree to which teachers require target-class students to employ advanced thinking skills in their writing assignments. A high score indicates that students use original thought, consider multiple solutions, and use evidence to support their ideas. (Reliability = 0.73)

How often do students turn in written assignments that:

- Use evidence to support their ideas?
- Demonstrate original thought and ideas?
- Consider multiple solutions or perspectives?

Homework assignments and expectations examines the teachers' expectations for an average student in the class in the amount of time they spend doing homework and studying each week in preparation for the class.

How many hours do you expect the average student to spend doing homework and studying for this class?

(None, less than 30 minutes, 30-60 minutes, 1-2 hours, more than 2 hours)

Academic Challenge and Classroom Control (Student Behavior)

Quality of student discussion indicates teachers' opinions about how much they encouraged students to interact with each other in the target class. High levels indicate that students build on each other's ideas and provide constructive feedback during discussions. (Reliability = 0.73)

To what extent do the following occur during class sessions?

- Students build on each other's ideas during discussion.
- Students used data and text to support their ideas.
- Students show each other respect.
- Students provide constructive feedback to their teachers/peers.
- Most students participate in discussion at some point.

(Very little, some, quite a bit, a great deal)

Classroom Control/Student Behavior

Student academic responsibility measures the extent to which students attend the target class regularly and actively participate in the activities of the class. A higher score indicates more participation by students. (Reliability = 0.89)

How many students:

- Come to class on time?
- Come to class regularly?
- Come to class prepared with appropriate supplies and books?
- Regularly pay attention in class?
- Actively participate in class?
- Always turn in their homework?

Student misbehavior measures the frequency with which the target class is disrupted because of student misbehavior

How often on a typical day is your class disrupted by student behavior?

Classroom disruption measures the frequency with which the target class is disrupted because of events such as announcements, noise in the hallway, etc.

How often on a typical day is your class interrupted by announcements, tardy students, noise, etc.?

How We Analyzed the Relationships Between the Classroom Instructional Environment and Student Outcomes

For the analysis of test score gains, we first calculated each eleventh-grade student's gain from the 2008 PLAN to the 2009 ACT on three subtests (English, math, and science). Science subtest gains were modeled for students who reported on the classroom instructional environment of science classes, English subtest gains were modeled for students describing English classes, and math subtests for students describing math classes. We used three-level hierarchical linear models in which students are nested within classrooms and schools. Science, English, and math subtest gains from the PLAN to the ACT were modeled as a function of the subject-specific PLAN subtest score at level one with dummy variables representing each PLAN possible plan score to allow for non-linear relationships. Additional control variables included: ninth-grade test scores, gender, race, SES, and special education status, as well as dummy variables for test subject and interactions of test subject times score on the prior test. At level two, gains were modeled as a function of the classroom instructional environment (challenge and student behavior), controlling for the subject (English, math, or science class). No school-level controls were included in the analysis. The analysis was based on 8,754 students in 794 classrooms in 70 high schools.

For the GPA analysis, we used the 2009 spring semester subject-specific GPAs for students in ninth through twelfth grade. Course subjects included science, math, English, foreign language, and social studies. Science GPA was used for students describing the classroom instructional environment of science classes, math GPA was used for students describing math classes, etc. GPAs from all five subject areas were combined in a single analysis and were modeled as a function of students' background characteristics at level one and at level two (including prior test scores, gender, race, SES, and special education status), as a function of the classroom instructional environment (challenge and student behavior), controlling for the subject (science, English, math, or science class). No school-level controls were included in the analysis. The analysis was based on 58,824 students in 2,575 classrooms in 88 schools.

MORE INFORMATION on the analysis of surveys of classroom instructional environment can be found in the report *Classroom Instructional Environments in Chicago High Schools: Implications for Effectively Improving Course Rigor and Student Achievement in an Urban School District*, available at http://ccsr.uchicago.edu/publications.

This report provides a number of different analyses of the relationships of classroom instructional measures with student achievement, including:

- Correlations of each instructional element with student outcomes
- Combined relationships of instructional elements with student outcomes
- Relationships of teacher reports of instruction with student outcomes
- Classification of classrooms based on multiple instructional elements
- Prevalence of classrooms with different types of instruction environments within and across schools

It also provides methodological details of the latent class analyses and statistical models.

How We Gathered Information on Students and Classrooms for the Case Studies

The case studies are drawn from the Focus on Freshmen Project—an in-depth, multi-method study of the transition to high school that gathered data through student interviews, observations of students' math and English classes, and interviews with their teachers. Data collection was based around a core sample of students who were enrolled in eighth grade in four neighborhood public elementary/middle schools in Chicago—schools that had fairly tight feeder patterns into the five high schools where we planned to collect ninth-grade data. The high schools were selected to include two schools that had better ninth-grade on-track rates than other schools serving similar students, two with lower on-track rates than other schools serving similar students, and one school that had typical on-track rates. There were two predominantly African American high schools, two predominantly Latino high schools, and one racially mixed school.

Students were selected to participate based on their seventh-grade scores on the Illinois Standards Achievement Test (ISAT) and their grades; we over-sampled middle-achieving students. We did not include students with very weak seventh-grade test scores and grades, or very high test scores and grades, as we wanted to study students whose ninth-grade course performance could not be strongly predicted by prior performance (i.e., not students who would almost certainly pass or fail their ninth-grade courses). Students that had been accepted to a charter or a selective school for ninth grade were not included in the sample. We selected more eighth-grade students for our sample than we planned to follow through the study, expecting that not all would enroll in one of the five study high schools in the following fall. In the eighth-grade year, there were 72 students who participated in the study. The following year, 55 of those students enrolled in ninth grade the next fall in one of the five study high schools and continued to participate in the study throughout the next year and into their tenth grade year.

Each student was interviewed twice during their eighth-grade year, four times during their ninth-grade year, and once during their tenth-grade year through in-depth, semi-structured interviews, conducted between May 2008 and May 2010 (for a total of 379 interviews). Researchers also observed each student's English and math classes, twice in the eighth-grade year and twice in the ninth-grade year, as well as additional ninth-grade classes in study high schools (for a total of 149 classroom observations). Classroom observations captured instruction for the entire class, not just the students who were part of the interview sample. In addition, we interviewed the classroom teachers we observed about the observed lessons, and their general strategies and goals for supporting student achievement in that class. There were a total of 108 teacher interviews. We also interviewed 14 administrators and school leaders across the five high schools about school policies and strategies around discipline, remediation, and supporting student achievement in the ninth-grade.

In analyzing the classroom observation data, we used rubrics to assign a value to each classroom observation on multiple dimensions, teacher-student interactions, academic demands, student participation, etc. Two of these dimensions captured the degree of challenge in the classroom: level of content and level of cognitive demands. In assigning these ratings, we did not intend to evaluate teachers; rather, we aimed to get a general picture of ninth-grade students' classroom experiences. The content of the material covered in each math classroom observation was classified as pre-algebra, algebra I, algebra I or II, or algebra II. The cognitive demands in the same observations were categorized as higher, medium, lower, or very low:

Higher cognitive demand activities require students to make connections between procedures and the underlying mathematical ideas. For example, in one eighth-grade classroom students were asked to create paper "bridges" of various layers of thickness to see how much weight they could hold. They then had to graph the data, decide if the thickness of

the bridge and the breaking weight of the bridge was a linear or non-linear relationship, and finally conclude how the relationship could be shown in a table or graph. Higher cognitive demand activities were observed in only three of 37 ninth-grade algebra classroom observations; they were more common in eighth-grade math classes.

Medium cognitive demand activities require students to use multiple representations (graphic, numeric, symbolic, or verbal) in applying a procedure and/or link the procedure to applications outside mathematics, but they do not link the procedure to underlying mathematical concepts, meaning, or understanding. For example, in one ninth-grade classroom students worked in groups to arrange red and blue tiles in three different patterns. Each pattern represented the coordinates of a point and was supposed to be a visual representation of rise over run. The students were supposed to then look at other groups' patterns and find the slope of the line. Eight of the 37 ninth-grade mathematics classes fell into the medium cognitive demand category.

Lower cognitive demand activities require students to apply a procedure without linking it to underlying mathematical concepts, meaning, or understanding or to applications outside mathematics. For example, in one ninth-grade class the teacher reviewed the equation of a line ($y = mx + b$) and how to solve for the y-intercept with the class. Students then worked individually on completing a worksheet containing problems in which they had to find the equation of a line. The large majority of observed ninth-grade mathematics classes fell into the lower cognitive demand category (24 of 37).

Very low cognitive demand activities require students to memorize or reproduce facts, rules, formulas, or definitions with little or no connection to mathematical concepts or meaning (very low cognitive demand). For example, in one ninth-grade class students were asked to copy various vocabulary words and definitions related to polynomials. Two of the 37 ninth-grade mathematics classes were engaged in activities requiring very low cognitive demand.

For each English classroom observation, the observation was broken down into distinct activities that students were asked to complete, and each activity was assigned a separate level of content and level of cognitive demands. The content of the material was classified based on the grade level equivalent of the material and received a categorization of none, silent reading (level not able to be determined), more than two grade levels below, one or two grade levels below, or grade level. The level of cognitive demand for each activity that students were asked to do was categorized as level 1: remember, level 2: understand, level 3: apply, or level 4: analyze, evaluate, or create.

Endnotes

1 One study used surveys of students and teachers to examine the degree to which different aspects of instruction (e.g., challenge, order, monitoring) were related to test score gains and grades. The second study followed a sample of students as they experienced the transition from eighth to ninth grade and into the tenth-grade year, interviewing students, observing their math and English classes, and interviewing their teachers. Each student's English and math classes were observed twice in eighth grade and twice in ninth grade (fall and spring), with teacher interviews following each observation. Students were interviewed seven times from eighth to tenth grade. The studies were conducted at the same time, so that the ninth-grade interviews and observations were a subsample of the students and teachers in the large-scale survey study.

2 National Commision on Excellence in Education (1983).

3 NCES (2007); Roderick et al. (2009).

4 ACT, Inc. (2012); Achieve, Inc. (2004).

5 National Academy of Sciences (2007); Cavanagh (2012).

6 National Governors Association (2005).

7 For a description of the new standards, see http://www.corestandards.org.

8 U.S. Department of Education (2012).

9 See Lee and Ready (2009) for a review of these studies.

10 Schmidt and Houang (2012).

11 Attewell and Domina (2008); Chaney, Burgdorf, and Atash (1997); Gamoran and Hannigan (2000); Adelman (1995); Horn and Hojaku (2001).

12 See Lee and Ready (2009) for a full discussion.

13 Although we have survey information from both students and teachers, we focus on student surveys in this brief because the teacher survey data do not provide information on a number of key dimensions of instruction—course clarity, student interest, monitoring and personalization, and teacher-student relationships. The student surveys provide information on all aspects of instruction asked in the teacher surveys and provide additional information on teacher monitoring and support.

14 These tests include four components—math, science, reading, and English. We compared gains in math classes to the gains on the math component, science classes to the science component, English classes to the English component, and social science classes to the reading component. Because of high measurement error on the tests, classroom-level gains are not reliable. However, we pool information from thousands of classrooms to obtain reliable estimates of the relationships between classroom instructional elements and gains on the tests. All gains control for students' initial test scores, their test scores in elementary school, and their background characteristics.

15 This compares students with similar pretest scores and background characteristics.

16 Gates Foundation (2010).

17 Farrington et al. (2012).

18 Shernoff et al.(2003).

19 When reporting on remedial or regular classes, fewer than 20 percent of teachers characterized their classrooms as having strong control—where instruction was rarely interrupted by student behavior. A third of teachers in regular-level classes reported that student behavior is out of control, where instruction is disrupted at least 2-3 times in a typical day. In contrast, in over half of the Honors and AP classrooms, teachers reported very high classroom control, where the class is almost never interrupted by student behavior problems. Less than 10 percent of Honors or AP had weak control.

20 Nomi, and Allensworth (2012).

21 Seidman et al. (1996) found that, for poor, urban high school students, increased amounts of academic demands and hassles across the high school transition were associated with lower expectations for academic efficacy, less preparation for class, and lower GPAs. In algebra classes in Chicago, we found that students' grades were

lower when their incoming skills were substantially lower than their classroom peers (Nomi and Allensworth, 2012), even if their skills were above average compared to national norms—suggesting that students struggle when they feel like they are behind their classmates.

22 Rumburger and Lim (2008); Allensworth and Easton (2007); Geiser and Santelices (2007); Roderick, Nagaoka, and Allensworth (2006); Bowen, Chingos, and McPherson (2009).

23 The names used in the quotes and cases are pseudonyms.

24 Ontario High School (pseudonym) is a predominantly African American high school where the typical ninth-grader scores at about the 25th national percentile on exams.

25 This is in contrast to other ninth-grade algebra classes observed, which were generally coded as having lower cognitive demand. (For more information about how we analyzed and coded the observations, see the box, *"How We Gathered Information on Students and Classrooms for the Case Studies,"* on p.26.)

26 Students had to complete a series of problems that gave the height of a container (5.4 cm) and asked them to find how tall a stack of 10 containers would be if each additional container adds 0.5 cm of additional height (answer = 9.9). Subsequently, students had to find the height if there were 14 containers. Ultimately, students had to come up with an equation to find the height of the stack of containers [H = 5.4 + 0.5 (C-1)].

27 Learning gains and grades in ninth-grade algebra classes were compared through hierarchical statistical models that nested students within classrooms, as well as controlled for students' incoming test scores and demographic characteristics. All ninth-grade math classes in the district were included in the analysis. Classroom-level residuals were used to determine whether test gains in each class were higher or lower than the system average, comparing students with similar incoming characteristics. See box, *"How We Analyzed the Relationships Between Classroom Instructional Environment and Student Outcomes.,"* on p. 25.

28 Allensworth and Easton (2007). This work compared similar students at similar schools—students with the same test scores and backgrounds got better grades and had better attendance at schools with more trusting relationships between teachers and students.

29 Stevens and Johnson (forthcoming).

30 Stevens and Johnson (forthcoming).

31 See, for example, Marchand and Skinner (2007) and Ryan et al. (1998).

32 Bandura, A. (1986); Bouffard-Bouchard, T. (1990); Lent, R.W., Brown, S.D., and Larkin, K.C. (1984).

33 We compared average grades and test gains in ninth grade by classroom through hierarchical models that nested students within classrooms. These models controlled for students' test score the prior year in the corresponding subject, thus, the classroom average grades or test gains were adjusted for students' performance in the prior year. See box, *"How We Analyzed the Relationships Between Classroom Instructional Environment and Student Outcomes,"* on p.25.

34 Kalogrides and Loeb (2013).

35 Melnick and Meister (2008); Veenman (1984).

Notes From Boxes

A The New Basics Curriculum was a minimum curriculum recommended by the National Commission of Excellence in Education in 1983 consisting of four years of English; three years each of mathematics, science, and social studies; and one-half year of computer science. The CPS requirements are actually slightly higher than the New Basics Curriculum, including two years of a foreign language and specific courses in mathematics (algebra, geometry, advanced algebra, trigonometry).

B Allensworth et al. (2009); Montgomery, Allensworth, and Correa (2010).

C Nomi and Allensworth (2009); Nomi and Allensworth (2014).

D Sporte et al. (2009).

E Sporte and Sebastian (2010).

F Latent class analysis was used to identify patterns of instructional elements in classrooms. Measures tended to cluster along the dimensions of student behavior, challenge, and support. Classrooms strong in one measure within a dimension (e.g., challenge) tended to be strong on the other measures; those that were weak in one measure in the dimension tended to be weak in the others.

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