School Context, Student Attitudes and Behavior, and Academic Achievement:

An Exploratory Analysis

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Overview

What are the key factors that promote academic success among students whose demographic characteristics and school circumstances place them at high risk of failure? This paper provides highly suggestive, although not conclusive, answers to this question. Through path analysis modeling techniques applied to data collected in MDRC's evaluation of the First Things First school reform initiative in a large urban school district, the paper explores the influence of two psychological variables — student engagement and perceived academic competence — on achievement in reading and mathematics.

This study's findings may have important implications for understanding how students learn in the classroom. Consonant with previous research, they indicate that both engagement in school and students' perception of their own academic competence influence achievement in mathematics for high school students. But the study departs from earlier work in suggesting that perceived academic competence may be more influential than engagement in boosting achievement in both mathematics and reading. Indeed, analyses indicate that perceived competence had a stronger influence on subsequent engagement than engagement had on students' perceptions of themselves as competent learners.

The findings also make clear that supportive teachers and clear and high expectations about behavior are key to the development of both student engagement and perceived competence. This study suggests that the earlier schools and teachers begin to build students' confidence in their ability to do well, the better off students will be. Because students' perceptions of their capacity for success are key to their engagement in school and learning, schools should be designed to enhance students' feelings of accomplishment. Teachers whom students see as supportive and who set clear expectations about behavior help create an atmosphere in which students feel in control and confident about their ability to succeed in future educational endeavors.

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Introduction

Much research in recent years has focused on identifying the key factors that promote academic success among students whose demographic characteristics and school circumstances place them at high risk of failure. In large part, this research has addressed the characteristics of individual students and school settings that are optimal for success. Literature largely supports the positive role that students' attitudes and behavior play in improved academic achievement. Several studies have found that engagement in school and perceived academic competence (that is, positive feelings about one's ability to be successful academically) strongly predict improved reading and mathematics achievement. Similarly, literature supports the positive influence of factors in the school context — for example, the presence of high-quality, engaging instructional activities and supportive adult relationships — in improving students' academic outcomes.

This paper examines the relationships among these three constructs — school context, student attitudes and behavior, and achievement — using longitudinal data from a large-scale high school reform effort. The analysis is exploratory in nature, in that it tests one particular hypothesis about the relationships among these constructs. Other hypotheses may be equally plausible, but this paper considers the relationships shown in Figure 1, which presents the theoretical model underlying the effort.

Student attitudes and behavior stand at the center of the figure and the theory that underlies it. As the figure indicates, it is hypothesized that student attitudes and behavior (1) contribute to mathematics and reading achievement among high school students, and (2) result from key factors in the school context: support from teachers; clear, high, and consistent expectations; and high-quality instruction. That is, the positive influence of school context on improved achievement is mediated by students' attitudes about themselves as learners and by behavior that is correlated with academic success.

The figure suggests two major research questions that frame the analyses in later sections:

1. What is the influence of the two psychological variables — engagement in school and perceived academic competence — on student achievement in reading and mathematics?

2. If these psychological variables do have a positive influence on achievement, which elements of the school context support the development of higher levels of student engagement and perceived academic competence?

School Context, Student Attitudes and Behavior, and Academic Achievement

Figure 1

Theoretical Model

School Context	Student Attitudes and Behavior	Student Achievement
▪ Supportive relationships with teachers ▪ Clear, high, and consistent behavioral and academic expectations ▪ High-quality instruction and pedagogy	▪ Engagement ▪ Perceived academic competence	▪ Math ▪ Reading

Student Background and Previous Achievement
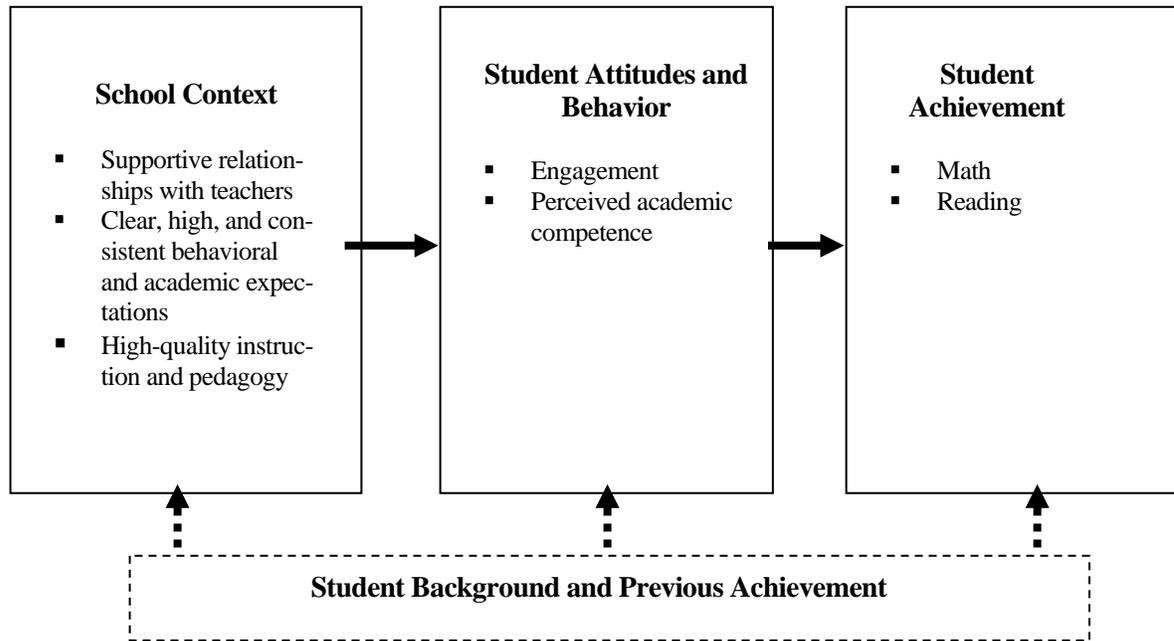
In addition, the research addresses two secondary questions:

3. What is the directionality of the relationship between perceived academic competence and student engagement — that is, does perceived academic competence influence engagement or vice versa?

4. What is the directionality of the relationships between variables in school context and the psychological variables?

In Figure 1, the variables of paramount interest to the study are enclosed in solid-line boxes. As the figure indicates, students' background characteristics and their levels of prior achievement influence their subsequent achievement, attitudes and behavior, and perceptions of school context. While the analysis takes these factors into account, it does not focus on them; in the figures shown in this paper, dotted-line boxes surround these two sets of variables.

The next section offers a brief overview of the relevant literature on student attitudes and behavior and their relationship to academic achievement and on elements of school context

that are associated with student success. This is followed by an overview of the research design: the sample of students followed in the study, the measures and their sources, and the analytical model. The study's findings are presented, and the paper concludes by discussing the practical implications of these findings for educators and policymakers.

Contextual and Psychological Predictors of Student Learning and Success: A Review of the Literature

There is substantial evidence that engagement in school is important in promoting student success and learning and that a number of factors in the school environment foster high levels of engagement. Research also suggests that the influence of the educational context on engagement is partially mediated by psychological beliefs about competence and control. The next sections briefly summarize the literature relevant to these points.

Engagement and Learning

Student engagement can be defined as the level of participation and intrinsic interest that a student shows in school.[1] Engagement in schoolwork involves both behaviors (such as persistence, effort, attention) and attitudes (such as motivation, positive learning values, enthusiasm, interest, pride in success).[2] Thus, engaged students seek out activities, inside and outside the classroom, that lead to success or learning. They also display curiosity, a desire to know more, and positive emotional responses to learning and school.[3]

Extensive evidence exists that engagement and motivation are critical elements in student success and learning. Researchers agree that engaged students learn more, retain more, and enjoy learning activities more than students who are not engaged.[4] Studies have shown a direct link between levels of engagement and achievement in reading and mathematics.[5] Many school-level studies have identified higher levels of student engagement as important predictors of scores on standardized achievement tests, classroom learning and grades, and student persistence.[6]

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[1]Newmann (1992).

[2]Connell and Wellborn (1991); Johnson, Crosnoe, and Elder (2001); Newmann (1992); Skinner and Belmont (1993); Smerdon (1999); Turner, Thorpe, and Meyer (1998).

[3]Newmann (1992).

[4]Dowson and McInerney (2001); Hancock and Betts (2002); Lumsden (1994).

[5]Kirsch et al. (2002).

[6]National Research Council (2000). As important as student engagement has been found to be in supporting and leading to learning, a substantial number of high school students, particularly those in urban school systems with large numbers of poor, minority students, are disengaged from school. This jeopardizes their ability to learn and advance through the educational system. Some studies have found that 40 to 60 percent of high school students are chronically disengaged, as exhibited by inattentiveness, lack of effort, inability or unwill-

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Perceived Competence and Control as Mediators of the Relationship Between School Context and Student Engagement

A primary psychological mediator of the relationship between student engagement and educational context is the degree to which students feel competent and confident of their ability to be successful in completing educational tasks. Students who are convinced that they lack the ability to succeed or control the outcome of their educational experience will not make an effort to engage or excel in school-related work.[7] To become successful, students need to know what it takes to succeed and believe they can succeed, given what they know. Thus, a student who doesn't think she can complete assigned homework successfully, or who doesn't understand what to do, is unlikely to attempt the assignment. Similarly, a student who doesn't think he will be able to pass the courses needed to graduate is unlikely to do much work and may end up cutting class or even dropping out.

Students' beliefs about their competence and their expectations for success in school have been directly linked to their levels of engagement, as well as to emotional states that promote or interfere with their ability to be academically successful. For example, students who believe they are academically incompetent tend to be more anxious in the classroom and more fearful of revealing their ignorance.[8] They fear that educational interactions will result in embarrassment and humiliation, and this, in turn, inhibits them from behaving in ways that might help them, such as asking questions when they are confused or engaging in trial-and-error problem-solving.[9] In addition, such students are more likely to avoid putting much effort into a task so that they can offer a plausible alternative to low ability or lack of knowledge as an explanation for failure — for example, "I could have done it if I tried, but I didn't feel like doing it."[10]

Factors in the School Context that Support Student Success

Research suggests that variables in the educational context are important in supporting and sustaining positive academic self-perceptions and engagement in school.[11] This research base is mostly qualitative, correlational, or quasi-experimental and falls short of the random assignment design that some researchers believe is necessary to draw causal conclusions. Never-

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ingness to compete educational tasks and assignments, and self-reported levels of boredom. This figure takes into account only students who are still in school, not those who have dropped out (Marks, 2000; Sedlak, Wheeler, Pullin, and Cusick, 1986; Steinberg, 1996). The proportion of low-income, minority, urban students who report being disengaged is even higher (National Research Council, 2003).

[7] Atkinson (1964); Eccles et al. (1983); Skinner, Wellborn, and Connell (1990); Skinner, Zimmer-Gembeck, and Connell (1998).

[8] Abu-Hilal (2000); Bandalos, Yates, and Thorndike-Christ (1995); Harter (1992); Hembree (1988).

[9] Newman and Goldin (1990); Ryan and Pintrich (1997).

[10] Covington, Spratt, and Omelich (1980).

[11] National Research Council (2003).

theless, the evidence is consistent enough to suggest that school context plays an important role in student learning and achievement through its relationship with student engagement.

Relationships between students and teachers and the climate in the classroom are positively associated with levels of student engagement and academic competence. Similarly, meaningful and challenging learning environments have been linked to both engagement and perceived competence. When students are authentically engaged in meaningful, quality work, the likelihood increases that they will learn something new and remember what they learned.[12]

Three kinds of contextual factors merit special attention:

Sense of Belonging and Caring

Although learning involves individual cognitive and emotional processes, student motivation is also significantly influenced by a supportive network of relationships. The likelihood that students will be motivated and engaged in school is increased to the extent that they perceive their teachers, family, and friends as supportive. Schools that engage students promote a sense of belonging by personalizing instruction and creating a supportive, caring social environment where adults show an interest in students' lives in and out of school.[13] The research on belonging in educational contexts is relatively new, and the direction of causality has not been definitively established.[14] Nevertheless, many correlational and nonexperimental studies have shown that students who report caring and supportive interpersonal relationships in school have more positive academic attitudes and values and are more satisfied with school.[15] Such students also are more likely to attend school, learn more,[16] and report that they are more engaged in academic work.[17]

Clear, High, and Consistent Expectations

High, clear, and consistent expectations also support students' self-confidence, their belief that their efforts will lead to success, and their engagement in school.[18] A substantial body of evidence demonstrates that schools where students achieve high levels of performance tend to set high expectations and standards.[19] To motivate students, however, standards and expecta-

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[12]Hancock and Betts (2002); Willms (2002).

[13]National Research Council (2003).

[14]National Research Council (2003).

[15]Baker (1999); Battistich, Solomon, Kim, Watson, and Schaps (1995); Ryan and Deci (2000); Shouse (1996); Skinner and Belmont (1993); Wasley et al. (2000); Yowell (1999).

[16]Bryk and Driscoll (1988); Bryk, Lee, and Holland (1993).

[17]Connell and Wellborn (1991).

[18]Eccles et al. (1983); Gambone, Klem, Summers, and Akey (2004); Wigfield and Harold (1992).

[19]Baker, Terry, Bridger, and Winsor (1997); Evans (1997); Lambert and McCombs (1998); Lee, Bryk, and Smith (1993); Lee and Smith (1999); Phillips (1997).

tions must be clear and genuinely achievable.[20] Students are most likely to be academically engaged when goals are set at an appropriate level — that is, when they both challenge students and allow them to experience a sense of competence and accomplishment.

Meaningful and Challenging Educational Environments

Research on learning shows that students become cognitively engaged when teachers ask them to wrestle with new concepts, explain their reasoning, defend their conclusions, or explore alternative strategies and solutions.[21] Students enjoy learning more and are more likely to participate in school tasks when their teachers employ active pedagogical strategies. Collaboration among peers — students working together in pairs or small groups to help one another learn — also has been associated with increased engagement and learning.[22] When students can put their heads together rather than work in isolation, they are more receptive to challenging assignments.[23]

Research indicates that over the long term, students are more likely to be engaged in the classroom when they are asked to conduct experiments, participate in debates and role-playing, create models, and complete projects.[24] Evidence also suggests that when classroom instruction draws on students' preexisting knowledge, culture, and real-world experiences, it becomes more meaningful.[25] Students enjoy learning more and learn better when what they are studying is of personal interest and relates to their lives.[26]

Research Methods and Design

This section describes the study's design. It discusses the sample and data and the analytic methods and models used to address the research questions.

The Research Sample

This analysis draws on student surveys and administrative records data collected in MDRC's evaluation of the First Things First school reform initiative in a large urban school district during the 2001-2002, 2002-2003, and 2003-2004 school years.[27] Students in the analy-

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[20]Gambone et al. (2004); Lee and Smith (1999); Phillips (1997).
[21]National Research Council (1999).
[22]Davidson (1999); Johnson and Johnson (1985); Mitchell (1993).
[23]Cohen (1994).
[24]Davidson (1999); Guthrie and Wigfield (2000); Mitchell (1993).
[25]McLaughlin and Talbert (1993).
[26]Meece (1991).
[27]First Things First is a schoolwide reform initiative that has been implemented in multiple sites across the United States, including Kansas City (Kansas), Houston, St. Louis, and rural Mississippi. The initiative is based on structural changes in staffing and teaming; small learning communities; changes in leadership and

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sis sample attended three high schools in this district. Two of the schools had implemented First Things First for two years and one for three years when data collection ended; at all three schools, a year-long planning period preceded program implementation.

The sample consisted of 449 students for whom academic achievement measures were available for all three years of the study. Survey data for all students were available only for the second and third years. Because the sample includes only students who remained in school throughout the study period, sample members are not fully representative of all high school students in the district, which is marked by high dropout rates.

Sixty-four percent of the students were tenth-graders and 36 percent were eleventh-graders in the last year of the study. (Seniors were excluded from the analysis because the district did not administer reading and mathematics tests to twelfth-graders.) Males comprised half the sample. Sixty-seven percent of the students were Hispanic, 24 percent African-American, 4 percent white, and 5 percent other. Approximately 85 percent of the students received free or reduced-price lunch (an indicator of low socioeconomic status), 10 percent participated in special education programs, and 23 percent were in English for Speakers of Other Languages (ESOL) programs.

Measures and Data Sources

As summarized in Table 1, the analysis used data from surveys and administrative records to examine four broad sets of variables. Three of these categories of variables — academic achievement, student attitudes and behavior, and school context — correspond to the key constructs of interest in Figure 1. In the fourth category are student demographic characteristics, which were also taken into account in the analyses.

Administrative records contain test score data that are used in two ways: Year 1 test scores offer measures of prior reading and mathematics achievement, while Year 3 test scores provide information on subsequent achievement in these subjects. Administrative records also yield data on student background characteristics, as measured during Year 3. (Two of the five background characteristics measured — gender and race/ethnicity — represent invariant characteristics; low socioeconomic status, as measured by receipt of free- or reduced-price lunch, is also likely to have remained stable over time.) Survey data from both Year 2 and Year 3 provided measures of students' perceptions of the school context and their degree of engagement in school and perceived academic competence. These data are described in greater detail in Table 1.

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professional development; aligned, standards-based curriculum and assessment; and high-quality instructional approaches. For more information on the First Things First initiative, see http://www.mdrc.org/publications/412/overview.html.

Table 1

Constructs Measured, Data Sources, and Timeline for Data Collection

Construct Measured	Data Source	Years Measured		
		1	2	3
Student achievement	Administrative records			
Prior achievement		X		
Subsequent achievement				X
Student attitudes and behavior	Student surveys			
Engagement			X	X
Perceived academic competence			X	X
School context	Student surveys			
Teacher support			X	X
Clear, high, and consistent academic and behavioral expectations			X	X
High-quality pedagogy			X	X
Student demographic characteristics	Administrative records			
Gender				X
Race/Ethnicity				X
Free or reduced-price lunch				X
School[1]				X
Grade level				X

NOTES: [1]In no analysis did the school attended emerge as a statistically significant predictor; therefore it has been dropped from the subsequent tables.

Student Achievement

Scores on the reading and mathematics subtests of the Stanford Achievement Test (SAT) served as measures of student achievement. The SAT is a standardized achievement test administered to all students in the district in grades 1 to 11. The district administered one version of the test, the SAT-9, during the first two years covered by the study, changing to the SAT-10 in the third year; Year 3 scores were transformed into SAT-9 norms. Test scores are expressed in terms of normal curve equivalents (NCEs).[28]

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[28]Normal Curve Equivalent (NCE) scores have many of the same characteristics as percentile ranks, but are based on an equal-interval scale — that is, the difference between two successive scores has the same meaning at any two points along the scale.

Year 1 scores indicate students' achievement in grade 8 or grade 9. Year 3 scores indicate students' achievement in grade 10 or grade 11.

Student Attitudes and Behavior

Student survey responses were used to create two scales of student attitudes and behaviors: the Student Engagement Scale and the Perceived Academic Competence Scale. The Appendix shows the items that make up these scales, as well as those pertaining to school context, as discussed below.

The Student Engagement Scale is an index of how hard students work in school and their level of participation in activities associated with academic success. It consists of five items, including, "I work very hard on my homework" and "I don't try very hard at school." The Student-Perceived Academic Competence Scale is an index of students' perceptions about how successful they can be in school and the degree of control they have over their academic success. It contains nine items, including, "I can do well in school if I want to," "Trying hard is the best way for me to do well in school," and "I'm pretty smart in school." Internal consistency reliabilities for the indices ranged from .71 to .74 for School Engagement and .79 to .78 for Perceived Academic Competence in Years 2 and 3, respectively.

School Context

The student surveys also yielded measures of students' perceptions of three important aspects of the school environment: teacher support; clear, high, and consistent expectations; and high-quality pedagogy.

The Teacher Support Scale is an index of how much students feel that their teachers support them and like them. It consists of eight items, including, "My teachers interrupt me when I have something to say" and "My teachers care about how I do in school." Internal consistency reliabilities for the index ranged from .77 to .78 in Years 2 and 3, respectively.

Two indices assess the presence of clear, high, and consistent expectations. Academic expectations define what all students should know and be able to do within and across key content areas when they leave high school and at points along the way in their school careers. The Academic Expectations Scale contains 14 items, including, "Your teacher makes clear to you that you are expected to come to class prepared," "Everybody is expected to take part in classroom activities," and "Your teacher makes clear to you examples of high-quality work that will lead to high grades."

Conduct expectations define how adults and students should behave; there are clear benefits for meeting these standards and consequences for violating them. The Conduct Expectations Scale consists of 11 items, including, "Your teacher makes clear to you what student

conduct is unacceptable," "The rules in this school are very clear," and "Students in my school are expected to treat all of the adults in this school with respect all of the time." Internal consistency reliabilities ranged from .80 to .85 for Academic Expectations and .68 to .72 for Conduct Expectations in Years 2 and 3, respectively.

High-quality pedagogy is assessed by three indices of instructional practice: active learning strategies, making connections and extensions, and student-to-student interactions. Active learning is defined as engaging students in pairs or small groups to write, discuss, and/or manipulate learning equipment or materials. The Active Learning Strategies Scale contains 11 items. For example, students were asked, with respect to their English or math class, "How often do students in your class discuss and ask each other questions about the work you're doing?" and "How often do students in your class work on projects that last several class periods?"

Making connections and extensions is defined as the degree to which students participate in activities that require them to connect what they are learning to real-world circumstances, solve novel problems, and extend their knowledge to different situations. The Making Connections and Extensions Scale consists of four items, including, "When you are learning English [or math], how much do your teachers emphasize learning to find more than one way of approaching a problem or issue?" and "How much do your teachers emphasize making connections between what goes on inside and outside of school?"

Student-to-student interactions are defined as the level of interactions between students in classroom activities that are designed to promote learning. The Student-to-Student Interactions Scale has five items, including, "In your English [or math] class, how true is it that students go over and discuss each other's work?" and "How true is it that students review what they've learned with one another?" Internal consistency reliabilities ranged from .71 to .75 for Active Learning, .68 to .71 for Making Connections, and .76 to .74 for Student-to-Student Interactions in Years 2 and 3, respectively.

Data Analysis Strategy

The study employs *path analysis modeling techniques*. Path analysis is an extension of regression analysis, a statistical technique for producing a quantitative estimate of how much one variable (the "independent variable") influences another variable (the "dependent variable"). Path analysis models specify hypothesized associations or directional relationships among a set of sequentially ordered variables. A given model is usually depicted as a set of circles or boxes representing the variables that are connected by one-way arrows, which indicate the hypothesized direction of causation. Each variable in a path analysis model is considered as the dependent variable in a regression analysis in which antecedent variables are treated as independent variables; at the same time, a variable that serves as a dependent variable in one part

of the model may serve as an independent variable in another part of the model. The strength of path analysis is that particular influences can be examined while controlling for all other variables in the model; both direct and indirect influences can be examined.[29]

Path analysis is used to test various causal models that the researcher is comparing. The regression weights predicted by each analysis model are compared with the correlation matrix for the variables, and a goodness-of-fit statistic is calculated. The best-fitting of two or more models is selected by the researcher as the best model for advancement of the theory.

Path analysis requires the usual assumptions of regression analysis. It is particularly sensitive to model specification, because failure to include relevant causal variables or the inclusion of extraneous variables often substantially affects the path coefficients, which are used to assess the relative importance of various direct and indirect causal paths to the dependent variable. Such interpretations should be undertaken in the context of comparing alternative models, after assessing their goodness of fit.

By using EQS, a latent variable modeling regression software program,[30] analyses were conducted that took into account the residual error of each predictor and criterion variable in the model. This accounting for residual error allowed the relationships among latent constructs to be modeled by removing sources of error that may have had an adverse influence on the statistical findings.

Different path analysis models address the four research questions set out at the beginning of the paper.

Figure 2 depicts the model used to answer the first question:

- What is the influence of the two psychological variables — engagement in school and perceived academic competence — on student achievement in reading and mathematics?

This analysis estimated the longitudinal influence of student engagement and perceived academic competence on achievement. Year 3 mathematics and reading achievement scores were the critical outcomes of interest (the dependent variable), while engagement and perceived academic competence, measured in Year 2, were the key predictor (independent) variables. Separate analyses were conducted for reading and mathematics achievement.

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[29]The *direct effect* is the partial coefficient (beta for standardized, b for unstandardized) for y on x controlling for all prior variables and all intervening variables in the model. The *indirect effect* is the total causal effect minus the direct influence, and measures the influence of the intervening variables.

[30]EQS-Structural Equation Modeling Software, Multivariate Software Inc.

Figure 2

Influence of Student Attitudes and Behavior
on Student Academic Achievement
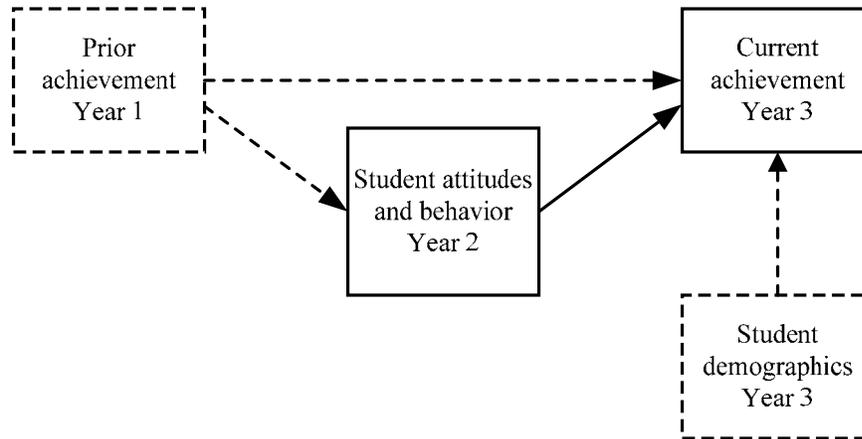
Like the others analyses described below, this analysis controlled for prior academic achievement (measured in Year 1) and student demographic and other characteristics (measured in Year 3) — variables that would be expected to be highly associated with the dependent variable.[31]

Other path analysis models tackled the second research question:

- If these psychological variables do have a positive influence on achievement, which elements of the school context support the development of higher levels of student engagement and competence?

Here, the key outcomes of interest are school engagement and perceived academic competence, as measured by the Year 3 surveys. Because the influence of school context on engagement in school and perceived academic competence may be either long term or immediate, two different analyses were conducted. The lagged analysis, shown in Figure 3a, examined the relationships between students' perceptions of the school context in Year 2 and their psychological dispositions in Year 3. In contrast, in the concurrent model, shown in Figure 3b, students' perceptions of school context and their psychological dispositions were measured in the same year, Year 3.

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[31]The measure of prior achievement is the average of reading and math NCE scores for Year 1.

Figure 3a

**Lagged Model of Influence of School Context on Student Engagement and
Perceived Academic Competence**
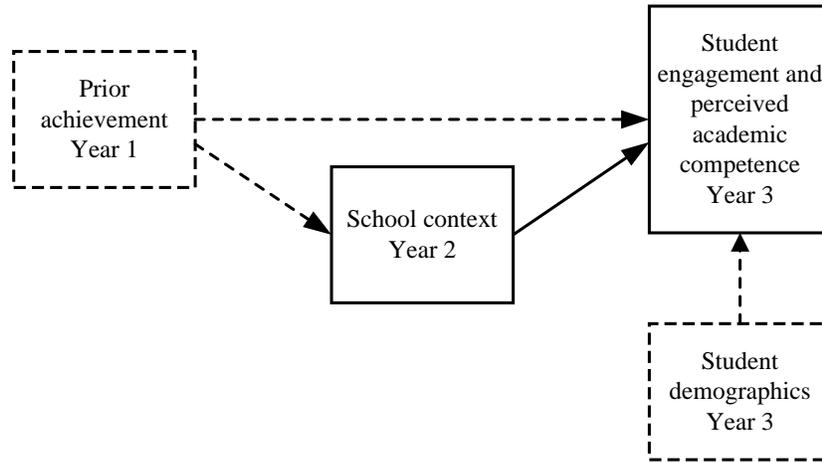
Figure 3b

**Concurrent Model of Influence of School Context on Student
Engagement and Perceived Academic Competence**
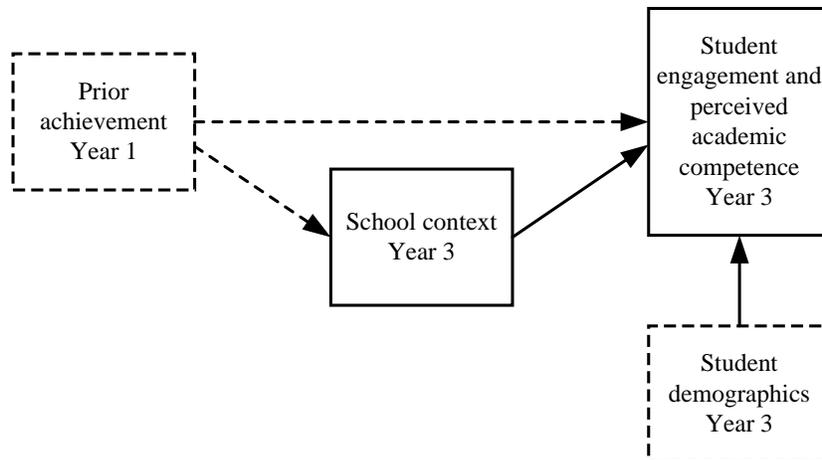
Yet another path analysis model was used to address the third research question:

- What is the directionality of the relationship between perceived academic competence and student engagement?

Did students who were initially more engaged in their schoolwork come to see themselves as more academically competent? Or did students who initially viewed themselves as more academically competent come to feel more engaged? Figure 4 shows this cross-lagged analysis.[32] Cross-lagged models allow researchers to simultaneously test the directional influence of two variables on one another over time and to make judgments about the relative strength of the influences.

A final set of models addressed the fourth question the study seeks to answer:

- What is the directionality of the relationships between school context variables and the psychological variables?

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Figure 4

Cross-Lagged Model of Relationship Between Student Engagement and Perceived Academic Competence

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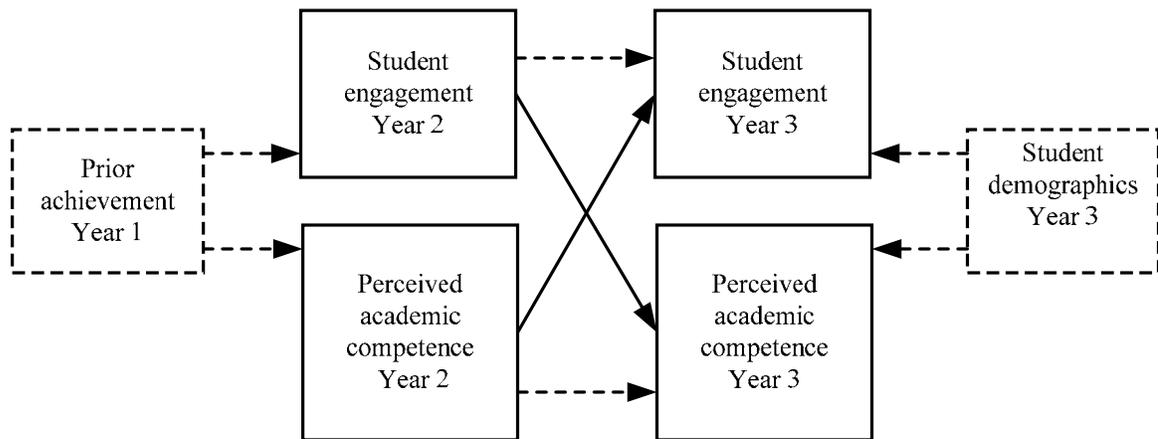
[32]The model in Figure 4 also controlled for school context variables in the analysis.

Did students who felt more supported by their teachers in Year 2 display greater engagement in Year 3? Or, conversely, did students who were more engaged in Year 2 perceive their teachers to be more supportive in Year 3? This analysis entailed another set of models in which the school context factors that were found to be statistically significant predictors of the psychological variables were cross-lagged with student engagement and with perceived academic competence. These models follow the general structure shown in Figure 5.

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Figure 5

Cross-Lagged Model of Relationship Between Student Engagement and Teacher Support
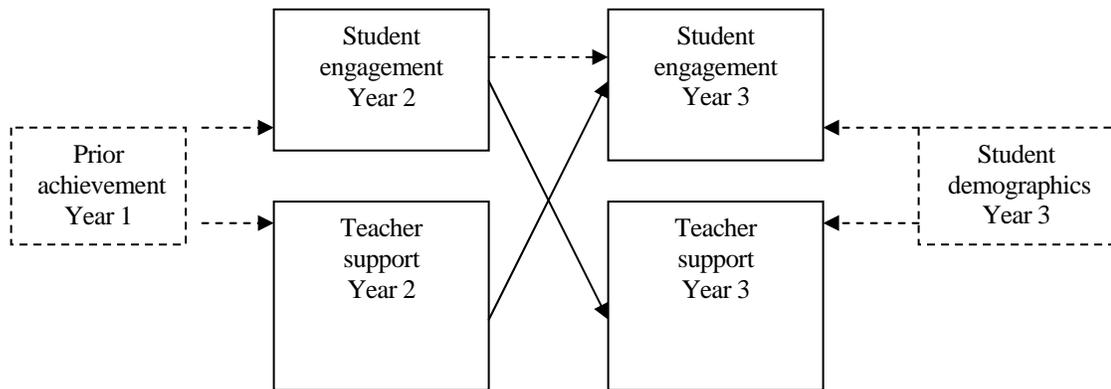
Different schools may offer their students different learning experiences, and these, in turn, may contribute to differences in student achievement, engagement, and perceived academic competence. To control for these potential differences on the dependent variable, a series of fixed school influences were entered into the model. These school-level fixed influences were included in all analyses.

It is important to acknowledge at the outset that while the purpose of the path analysis models is to provide estimates of causal relationships among variables, path analysis cannot establish definitively that one variable indeed has a causal role with respect to another variable.

At best, it can provide evidence that is *consistent with* causal explanations. In the text below, the term "influence" is used to describe the putatively causal role of one variable with respect to another — that is, Variable A is said to "influence" Variable B when evidence is consistent with the notion that A caused B.

Results

This section presents the study's findings. It begins by presenting descriptive statistics on the variables used in the analyses. Attention then turns to the four questions that underlie the study. The implications of the findings are discussed in the final section of the paper.

All of the analyses below control for student demographic characteristics and prior achievement in examining the relationships between the key variables of interest. To avoid redundancy, only *additional* control variables introduced in the analyses are noted in the text.

Descriptive Statistics

Table 2 shows the mean and standard deviation of each variable included in the analyses described above for each year in which the variable was measured. As noted above, the student achievement measures are NCE scores on the SAT-9 and SAT-10, while the measures of student attitudes and behavior and school context are scales whose value ranges from 1 to 4 (with higher values representing a greater quantity of a particular construct).

Research Question 1: The Influence of School Engagement and Perceived Academic Competence on Academic Achievement

The first research question examined the influence of student engagement and perceived academic competence on reading and math achievement. The key findings follow:

- **Finding 1.** Both prior student engagement and perceived academic competence had a significant positive influence on subsequent levels of math achievement, but the influence of perceived academic competence was three times larger than that of engagement.

- **Finding 2.** Perceived academic competence had a positive influence on reading achievement; the influence of engagement was more complex.

- **Finding 3.** Prior achievement was also significantly related to perceived competence, suggesting that students who do well on reading and mathematics assessment tests then perceive themselves as able learners, which promotes more reading and mathematics success.

Tables 3 and 4 provide the detailed results of the analyses for math and reading outcomes, respectively. The tables show the standardized regression coefficient of each independent variable. The standardized regression coefficient can be interpreted as the standard deviation change in the dependent variable associated with one standard deviation change in the independent variable. The tables also show the level of statistical significance associated with each coefficient.

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Table 2

Means and Standard Deviations of All Analysis Variables

Analysis Variables	Year 1[a]		Year 2		Year 3	
	Mean	SD	Mean	SD	Mean	SD
Student achievement						
SAT-9/10 mathematics achievement	40.23	15.48	NA	NA	43.66	13.16
SAT-9/10 reading achievement	34.31	17.64	NA	NA	38.93	17.91
Student attitudes and behavior						
Engagement	NA	NA	3.19	0.49	3.26	0.44
Perceived academic competence	NA	NA	3.2	0.54	3.27	0.57
School context						
Supportive teacher relationships	NA	NA	2.86	0.56	2.89	0.54
Clear, high, and consistent behavioral expectations	NA	NA	2.67	0.46	2.91	0.48
Clear, high, and consistent academic expectations	NA	NA	3.13	0.42	3.11	0.46
Pedagogy: making connections and extensions	NA	NA	2.74	0.59	2.82	0.6
Pedagogy: active learning	NA	NA	1.82	0.54	1.88	0.56
Pedagogy: student-to-student interactions	NA	NA	2.61	0.61	2.62	0.6

SOURCE: MDRC calculations from individual student school records from a large, urban school district (N=449).

NOTES: The student achievement measures are Stanford Achievement Test (SAT) scores expressed in terms of normal curve equivalents (NCEs). The measures of student attitudes and behaviors and of school context are scales whose value ranges from 1 to 4, with higher values representing a greater quantity of a particular construct.

[a]Prior Reading and Math Achievement is measured in Year 1. All other achievement and survey measures were measured in Year 2 and Year 3.

Mathematics Achievement

Table 3 shows the results of the analyses that examined the relationships between student engagement and perceived academic competence and mathematics achievement across all

Table 3

Influence of Student Attitudes and Behavior on Mathematics Achievement

Analysis Variables	Standardized Coefficient	Statistical Significance
Student attitudes and behavior[a]		
Engagement	0.052	*
Perceived academic competence	0.175	**
Student background		
Prior reading achievement	0.543	***
Race/Ethnicity		
Black	-0.233	***
Hispanic	-0.036	NS
White	0.169	**
Gender (males)	-0.021	NS
SES (free or reduced-price lunch)	0.002	NS
Grade (10th)	-0.079	*
Effects of prior achievement on student attitudes and behavior		
PA on student engagement	0.064	*
PA on perceived academic competence	0.264	***

SOURCE: MDRC calculations from individual student school records from a large, urban school district (N=449).

NOTES: Statistical significance levels are indicated as: *** = 1 percent; ** = 5 percent; *= 10 percent. NS=Not Significant.

[a]The correlation between school engagement and perceived academic competence in Year 2 is quite high, r = .582; therefore, this parameter was estimated in the model to improve model fit.

students. The results suggest that higher levels of both engagement and perceived academic competence in Year 2 preceded higher levels of math achievement in Year 3, although the influence of perceived academic competence was approximately three times larger than that of engagement. These findings suggest: (1) how competent a student feels in previous school years plays a primary role in predicting how well she or he will perform on subsequent math tests and

(2) how engaged a student is in behavior associated with school success (such as doing homework and trying hard in school) plays a secondary but meaningful role in determining the level of mathematics achievement.

How big were these influences? A useful way to think about this question is to compare the magnitude of the influence with the amount of change that would normally be expected over the course of a school year. Previous research has shown that on average, secondary students improve about one-quarter of a standard deviation in their reading or mathematics achievement over the year.[33] The standardized regression coefficient for engagement is .052, or approximately 21 percent of the change in mathematics scores that would be expected from the beginning until the end of the year. In comparison, the standardized regression coefficient for perceived academic competence — .175 — represents nearly 70 percent of the change in math achievement that would normally be expected over the course of the year.

Several characteristics in students' backgrounds were also significantly related to math achievement. As might be expected, prior math achievement had the strongest relationship with subsequent math performance, with an expected change in math scores of more than 7 NCE points. African-American students scored significantly lower than Hispanic or white students, on average, while white students scored higher than either Hispanic students or African-American students. Finally, tenth-graders in Year 3 scored slightly lower than eleventh-graders in Year 3.

Within the same model predicting mathematics achievement, it was also possible to estimate the influence of prior achievement on subsequent engagement and perceived academic competence. Students with higher math scores in Year 1 reported feeling more engaged and more academically competent in Year 2. Although prior achievement had a significant influence on both psychological outcomes, the influence was much stronger for perceived competence than for engagement. It appears that higher achievement test scores validated students' sense of themselves as able learners and had a weaker, but still statistically significant, influence on their commitment to doing a good job on their schoolwork.

Reading Achievement

Table 4 shows the results of the analyses that examined the relationships between engagement in school and perceived academic competence and reading achievement. The findings for reading were quite different from those for mathematics. While previous level of perceived academic competence was an important antecedent of achievement in both reading and math, engagement showed a quite different pattern. In contrast to the positive influence of a prior level

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[33]Kane (2004).

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Table 4

Influence of Student Attitudes and Behavior on Reading Achievement

Analysis Variables	Standardized Coefficient	Statistical Significance
Student attitudes and behavior[a]		
Engagement	-0.067	*
Perceived academic competence	0.167	**
Student background		
Prior reading achievement	0.722	***
Race/Ethnicity		
Black	-0.032	***
Hispanic	-0.087	
White	0.019	**
Gender (males)	0.041	NS
SES (free or reduced-price lunch)	0.004	NS
Grade (10th)	0.154	*
Effects of prior achievement on student attitudes and behavior		
PA on student engagement	0.063	*
PA on perceived academic competence	0.244	***

SOURCE: MDRC calculations from individual student school records from a large, urban school district (N=449).

NOTES: Statistical significance levels are indicated as: *** = 1 percent; ** = 5 percent; *= 10 percent. NS=Not Significant.

[a]The correlation between school engagement and perceived academic competence in Year 2 is quite high, r = .572; therefore, this parameter was estimated in the model to improve model fit.

of student engagement on mathematics achievement, *lower* levels of prior engagement appeared to be associated with greater future reading success.

As noted above, students would normally be expected to register an increase in reading of .25 standard deviation from the beginning to the end of the school year. But in this analysis, a one standard deviation increase in prior engagement produced a *reduction* in future reading test scores. Unlike student engagement, perceived academic competence was positively related to higher levels of future reading achievement. Students who felt more competent in Year 2 were likely to have higher reading achievement in Year 3.

To follow up on the unexpected negative relationship of engagement in school with reading achievement, a model was estimated that omitted perceived academic competence. As expected, the influence of engagement became somewhat stronger (b = .090) and positive. From these results, it appears that perceived academic competence had a mediating influence on the relationship between student engagement and reading achievement. This suggests that once the positive relationship between perceived academic competence and reading was accounted for, students displaying higher levels of engagement were less likely to be successful in their reading performance.

As an additional follow-up, interaction analyses were conducted to determine if the influence of engagement in school on reading achievement was different for students with different levels of confidence in their ability to be successful in school. The results from these findings suggest that engagement had a relatively strong influence on reading achievement (b = .197) for students with moderate levels of perceived competence, and a relatively weak influence on reading achievement for students with high and low levels of perceived competence (b = .031 and b = .033, respectively).

Interaction analyses were again conducted to examine more fully the relationship between perceived academic competence and reading achievement as a function of levels of engagement in school. The results of these analyses indicate that at low levels of engagement, the relationship between perceived competence and reading achievement was somewhat negative (b =-.067); at moderate levels of engagement, the relationship was relatively strong (b = .289); and at high levels of engagement, the relationship was positive (b = .091), but less strong than at moderate levels of engagement.

As with mathematics achievement, within the model of reading achievement it was possible to estimate the influence of prior achievement on subsequent engagement and perceived academic competence. Students with higher reading scores in Year 1 reported feeling more academically competent in Year 2; they also reported feeling more engaged in school, although this influence was weaker.

Research Question 2: The Influence of School Context on Student Attitudes and Behaviors

Since student attitudes and behaviors — especially perceived academic competence — appear to be important antecedents of math and reading performance, it is important to determine which conditions in classrooms support the development of higher levels of perceived academic competence and engagement in school. Key findings from analyses of this question include:

- **Finding 4.** Several aspects of school context — teacher support, clear and consistent expectations of behavior, and student-to-student interactions in the

classroom — were significantly and positively related to engagement. Teacher support and expectations of conduct had an immediate influence on student engagement that was stronger than the longer-term influence, although both influences were statistically significant.

- **Finding 5**. Teacher support and expectations of conduct were also significantly related to levels of perceived academic competence; again, the immediate influence of these variables was stronger than their longer-term influence.

- **Finding 6.** High academic expectations and a high level of student-to-student interactions in classroom instruction (such as student-led discussions) appear to have had a negative influence on perceived academic competence levels.

- **Finding 7.** Active learning and making connections and extensions did not appear to be related to either engagement or perceived academic competence. Academic expectations also were not related to engagement.

Tables 5 and 6 show the influence of characteristics of school context (that is, supportive teacher relationships; clear, high, and consistent expectations; and high-quality pedagogy) on engagement in school and perceived academic competence, respectively. For each dependent variable, results for both the concurrent and the lagged models are displayed.[34]

Student Engagement

Table 5 shows the results of the examination of the relationships between characteristics of school context and engagement in school. Both the concurrent and the lagged analysis models show that students who reported experiencing higher levels of support from their teachers and greater understanding of the conduct expected of them also reported higher levels of engagement in school. The influence of these two variables in school context was stronger when students experienced these conditions during the same year that they rated their degree of engagement. Unlike conduct expectations, high and clear academic expectations were not related to student engagement, either immediately or in the longer term.

Three variables measured the quality of pedagogy: active learning strategies, an emphasis on making connections between class work and life outside school, and instructional activities involving student-to-student interactions. In the lagged model, only student-to-student interactions were associated with subsequent engagement. When pedagogy and student engagement

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[34]Lagged models consist of predictors measured at Year 2 and outcome variables measured during Year 3, except for prior achievement which was measured in Year 1. Concurrent models consist of predictors and outcome variables measured during the same school year, Year 3, except for prior achievement and student background characteristics (measured in Year 1) and prior level of school engagement (measured in Year 2).

Table 5

Influence of School Context on Student Engagement

Analysis Variables[a]	Concurrent Model		Lagged Model	
	Standardized Coefficient	Statistical Significance	Standardized Coefficient	Statistical Significance
School context				
Supportive teacher relationships	0.235	**	0.065	*
Clear, high, and consistent expectations[b]				
Academic expectations	0.036	NS	0.034	NS
Conduct expectations	0.187	**	0.071	*
High-quality pedagogy and strategies[c]				
Active learning	0.049	NS	0.021	NS
Making connections and extensions	0.046	NS	0.023	NS
Student-to-student interactions	-0.013	NS	0.074	*
Student background				
Prior level of student engagement	0.434	***	0.487	***
Race/Ethnicity				
Black	0.039	NS	0.044	NS
Hispanic	-0.028	NS	-0.044	NS
White	0.006	NS	0.009	NS
Gender (males)	-0.126	**	-0.152	**
SES (free or reduced-price lunch)	-0.153	***	-0.089	*
Grade (10th)	-0.015	NS	-0.002	NS
Prior achievement (Year 1)			0.196	***

SOURCE: MDRC calculations from individual student school records from a large, urban school district (N=449).

NOTES: Statistical significance levels are indicated as: *** = 1 percent; ** = 5 percent; *= 10 percent. NS=Not Significant.

    [a]The overall lagged model accounted for approximately 45 percent of the variation in school engagement levels, scores (R-squared = .448). The overall concurrent model accounted for approximately 50 percent of the variance in school engagement levels (R-squared = .495).

    [b]To specify a correct model, both expectations variables were allowed to co-vary among each other. The correlation between academic and behavioral expectations was $r_{AE*BE} = .501$.

    [c]To specify a correct model, all three pedagogy variables were allowed to co-vary among each other. Correlations among pedagogy predictors are as follows: $r_{AL*MC} = .432$, $r_{AL*ss} = .349$, and $r_{MC*ss} = .416$.

were measured simultaneously, there was no relationship between the two constructs — suggesting that, for this sample at least, pedagogy played little role in explaining students' levels of engagement. One plausible explanation is that students consistently reported relatively low levels of high-quality pedagogy, leaving very little variation in their experience to be explained.

Student background also played an important role in explaining Year 3 engagement in school. The strongest predictor of current engagement in school was students' previous level of engagement. Students who were more engaged during one year were much more likely to be engaged the next. Prior achievement was also significantly related to Year 2 engagement; that is, students who had higher levels of academic achievement in the first year of the study were more likely to be engaged in school the next year. However, the influence of prior achievement on engagement appeared to be moderated by perceived academic competence. When level of perceived academic competence was taken into account, the influence of prior achievement on engagement was reduced by two-thirds. This suggests that some of the variation in students' levels of engagement in Year 3 was explained by how competent students felt the previous year, which was itself a function of how academically successful the students were in Year 1.

Perceived Academic Competence

Table 6 shows the results of concurrent and lagged analyses that examined the relationships between characteristics of school context and perceived academic competence. The analyses revealed that teacher support and high, clear, and consistent expectations of conduct contributed to students' belief that they could be successful. The influence was both immediate (when all constructs were measured in the same school year) and longer term (when support and conduct expectations were measured one year and academic competence the next year), although the immediate influence was much stronger than the longer-term influence.

However, in contrast to the student engagement results, higher levels of academic expectations and students' experience of more student-to-student interactions in their classes one year were associated with *lower* levels of perceived academic competence that year. That is, students reported that they felt *less* competent academically the more they experienced high, clear, and consistent academic expectations, and the more they were engaged in classroom activities that involved students working together. It may be that the more clearly students came to understand what constitutes high-quality performance — from examples provided either by their teachers or their peers — the more critical they became of their own work.

Background characteristics also played an important role in explaining how academically competent the students felt. The strongest predictor of perceived academic competence in

School Context, Student Attitudes and Behavior, and Academic Achievement

Table 6

Influence of School Context on Perceived Academic Competence

Analysis Variables[a]	Concurrent Model		Lagged Model	
	Standardized Coefficient	Statistical Significance	Standardized Coefficient	Statistical Significance
School context				
Supportive teacher relationships	0.265	**	0.067	*
Clear, high, and consistent expectations[b]				
Academic expectations	-0.097	*	0.037	NS
Conduct expectations	0.292	**	0.062	*
High-quality pedagogy and strategies[c]				
Active learning	0.004	NS	0.027	NS
Making connections and extensions	0.045	NS	-0.039	NS
Student-to-student interactions	-0.081	*	0.047	NS
Student background				
Prior level of perceived academic competence	0.519	***	0.505	***
Race/Ethnicity				
Black	0.078	*	0.087	*
Hispanic	-0.033	NS	-0.058	NS
White	0.029	NS	0.03	NS
Gender (males)	0.008	NS	-0.056	NS
SES (free or reduced-price lunch)	0.023	NS	-0.046	NS
Grade (10th)	0.037	NS	0.04	NS
Prior achievement (Year 1)			0.298	***

SOURCE: MDRC calculations from individual student school records from a large, urban school district (N=449).

NOTES: Statistical significance levels are indicated as: *** = 1 percent; ** = 5 percent; *= 10 percent. NS=Not Significant.

[a]The overall lagged model accounted for approximately 35 percent of the variation in perceived academic competence levels (R-squared = .398). The overall concurrent model accounted for approximately 49 percent of the variance in perceived academic competence levels (R-squared = .488).

[b]To specify a correct model, both expectations variables were allowed to co-vary among each other. The correlation between academic and behavioral expectations was $r_{AE*BE} = .497$.

[c]To specify a correct model, all three pedagogy variables were allowed to co-vary among each other. Correlations among pedagogy predictors are as follows: $r_{AL*MC} = .441$, $r_{AL*ss} = .347$, and $r_{MC*SS} = .402$.

Year 3 was perceived academic competence the previous year, controlling for prior achievement.[35] Finally, African-American students reported higher levels of perceived academic competence than students in other groups.

Research Question 3: Directionality of the Relationship Between School Engagement and Perceived Academic Competence

The longitudinal data used in this paper make it possible to consider the directionality of relationships among constructs in the model, answering the question, "Which came first?" In the previous analyses of the influences of student attitudes and behavior on reading and math achievement, the correlations between the measures of school engagement and perceived academic competence were quite high ($r = .582$ and $r = .584$, respectively). Since both engagement and perceived competence appear to be important antecedents of academic performance, it is useful to examine the relationship between the two variables. The key finding to emerge from this analysis is:

- **Finding 8.** The data suggest that perceived academic competence is more likely to precede engagement in school than vice versa.

The cross-lagged correlation model, shown in Figure 4, was used to estimate the directionality of the influence between student engagement and perceived academic competence. The analysis examined the influence of perceived competence measured in Year 2 on engagement measured in Year 3 (controlling for Year 2 engagement); it also estimated the influence of Year 2 engagement on Year 3 perceived competence (controlling for Year 2 perceived competence). Table 7 makes it clear that the lagged influence of perceived academic competence on student engagement was more than twice as large as the lagged influence of student engagement on perceived academic competence, although both influences were statistically significant. This suggests that perceived academic competence may precede engagement — that is, students who see themselves as academically competent become more engaged over time. The model also supports the theory — but less strongly — that students who are engaged early become more confident of their ability to be academically successful.

Research Question 4: Directionality of the Relationships Between the Psychological and School Context Measures

Do students who perceive the school environment as more supportive subsequently experience greater engagement and perceive themselves as more academically competent? Or do students who are more engaged and feel more competent then come to believe that their school

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[35]As noted above, prior achievement was related in an important way to students' feelings of perceived academic competence, and this, in turn, led to better academic outcomes.

Table 7

Cross-Lagged Influence of Student Engagement and Perceived Academic Competence

Model	Lagged Model	
	Standardized Coefficient	**Statistical Significance**
Student engagement influence on perceived academic competence	0.069	*
Perceived academic competence influence on student engagement	0.159	**

SOURCE: MDRC calculations from individual student school records from a large, urban school district (N=449).

NOTES: Statistical significance levels are indicated as: *** = 1 percent; ** = 5 percent; *= 10 percent.

environment is more supportive? The fourth research question examines the directionality of the relationships between student engagement and perceived academic competence and those school context characteristics that the preceding analyses found to be significantly associated with engagement and competence. (As a reminder, teacher support, expectations of conduct, and student-to-student interactions in the classroom were identified as important in developing student engagement; and teacher support and expectations of conduct contributed to students' expectations of success in school.)

Key findings answering this research question include:

- **Finding 9.** Students who were more confident academically and more engaged in learning tended to report more supportive relationships with teachers. There was also a weaker but nonetheless statistically significant influence in the opposite direction (that is, students who had more supportive relationships with teachers were more confident academically and were more engaged in learning).

- **Finding 10.** Students who believed that the rules of conduct in their school were clear and fairly administered were more likely to feel engaged and academically successful the next year.

- **Finding 11.** Students who said that they participated in learning activities that involved working with their classmates were more engaged in school a year later.

To examine the directionality of the influence of important variables in the school context on school engagement and perceived academic competence, cross-lagged models (like the one shown in Figure 5) were analyzed for each pair of school context and student attitudes and behavior variables. Table 8 presents the results.

School Context, Student Attitudes and Behavior, and Academic Achievement

Table 8

Cross-Lagged Influence of Student Engagement, Perceived Academic Competence, and School Context

	Lagged Model	
School Context Variables	**Standardized Coefficient**	**Statistical Significance**
Teacher support		
Student engagement influence on teacher support	0.202	**
Teacher support influence on student engagement	0.065	*
Perceived academic competence influence on teacher support	0.104	**
Teacher support influence on perceived academic competence	0.067	*
Conduct expectations		
Student engagement influence on conduct expectations	0.034	NS
Conduct expectations influence on student engagement	0.071	*
Perceived academic competence influence on conduct expectations	0.002	NS
Conduct expectations influence on perceived academic competence	0.062	*
Student-to-student interactions		
Student engagement influence on student-to-student interactions	0.046	NS
Student-to-student interactions influence on student engagement	0.074	*

SOURCE: MDRC calculations from individual student school records from a large, urban school district (N=449).

NOTES: Statistical significance levels are indicated as: *** = 1 percent; ** = 5 percent; *= 10 percent. NS=Not Significant.

Teacher Support and Student Engagement and
Perceived Academic Competence

Table 8 shows that the influence of student engagement and perceived academic competence on teacher support were stronger than the influence of teacher support on student engagement and perceived academic competence — from one and a half to three times greater. These findings suggest that students who are more academically confident and engaged tend to have more supportive relationships with teachers, and that teachers appear to be more supportive of students whom they perceive as more involved in the academic process. There was a less strong but statistically significant finding that students who experienced high levels of teacher support one year were somewhat more engaged the next year and also felt more confident of their ability to do well.

Conduct Expectations and Student Engagement and
Perceived Academic Competence

Expectations of conduct appeared to have a stronger influence on students' reports of engagement and their feelings of academic competence and success than vice versa. Students who reported that in their school there were clear and consistent behavioral norms and expectations for both students and teachers felt more academically confident and more engaged in school the next year. The opposite was not the case: Students who were more engaged and felt more competent in their studies did not necessarily see the school climate as fair.

Student-to-Student Interactions and Student Engagement

Participation in classroom activities in which students worked together and helped each other learn was significantly related to how engaged students were in school a year later. Prior level of engagement was not related to how much students experienced student-to-student interactions in the learning process.

Study Limitations

The findings suggest interesting correlations among student achievement, engagement in school, perceived competence, and school context and also provide some evidence about the direction and nature of the linkages among these constructs. However, it is also important to recognize that the study has several limitations associated with the sample of students in the analysis, the data collection methods and measures, and the overall modeling approach and specification of the model.

The sample for the study was drawn from an existing data set of students with unique characteristics. The students in the sample were primarily low-income, relatively low-achieving,

primarily Hispanic high school students. The findings may not generalize to students with different characteristics, such as those who come from more advantaged backgrounds, are higher-achieving, or are predominantly white or African-American. Equally important, the students in the sample had persisted in school from eighth grade to tenth grade (for the first cohort of students) or from ninth grade to eleventh grade (for the second cohort). Students who stay in school may be different systematically and may have perceptions that are different from those who have already dropped out of high school.

The data used in the analyses were based primarily on students' self-reports (with the exception of academic achievement data). They did not involve teachers' reports or direct classroom observations, only students' perceptions of classroom conditions. Without additional data, it is difficult to determine to what extent teachers demonstrated high-quality pedagogy and clear, high, and consistent academic and expectations of conduct.

There are other issues associated with the data. First, the linkages among school context, engagement in school, perceived academic competence, and achievement might have been much more clearly delineated if they had been related to specific learning tasks. In this study, students' survey responses were directed toward their current mathematics or English class in general, rather than to specific learning tasks.

Second, the measures of mathematics and English achievement were not specific to any one classroom context, but rather to the cumulative set of English or math classes taken by the student over the course of his or her school career, and therefore may have been quite insensitive to the real influence of engagement or perceived competence. More sensitive measures might be developed to link these constructs to a specific classroom context.

Third, the operational definitions of the constructs were based on a specific theoretical framework developed by the First Things First reform and drawn from existing data used in its evaluation. While the findings were limited to the confines of the measures and operational definitions associated with those measures, alternative conceptions of student engagement or high-quality pedagogy are possible. For example, a model that included items measuring more cognitive aspects of engagement might yield findings that differ from those presented here, which were based on self-reported behavioral engagement in school.

Finally, the approaches to data analyses used here cannot yield definitive conclusions. While the lagged models allow for testing hypotheses about directional influences, only with caution should the findings be interpreted as causal. It is possible for a condition to *precede* an outcome without *causing* the outcome. This notion of causality is even less tenable in the concurrent models, where no time lag exists between the measures.

Moreover**,** the general model hypothesized for this study (Figure 1) is only one of many plausible alternative models that could be postulated to examine the relationships among school context, engagement in school, perceived academic competence, and student achievement. In this study, pedagogy and academic expectations did not predict engagement in school and perceived academic competence. This finding does not necessarily mean that pedagogy and academic expectations have no influence on student attitudes and behavior. Rather, a different model may be needed to explain the relationship of these constructs to the measures of student attitudes, behavior, and performance in the study. For example, pedagogy may have a direct influence on achievement, which then may lead to increased engagement in school and perceived academic competence. Other constructs not measured here, such as a highly developed sense of classroom community, quality or immediacy of feedback, or level of recognition and praise may actually be the critical supports in the development of engagement in school and perceived academic competence.

Implications for Research and Practice

The findings of this study have important implications for understanding how children learn in the classroom. Engagement in school was a critical predictor of mathematics achievement for high school students, a finding that is consistent with much of the literature. In contrast to the existing literature, this study also suggests that perceived academic competence may play an even more important role than engagement in shaping achievement outcomes. The influence of perceived academic competence on both reading and mathematics achievement was between two and four times larger than that of engagement in school. Furthermore, perceived academic competence appears both to predict engagement and to mediate the influence of engagement on achievement.

The process, it seems, hinges on students developing a sense of efficacy and confidence about their ability to do well in school. Once students are confident of their ability to succeed, they become more engaged and learn more. On the other hand, students are not likely to attempt educational tasks when they feel they cannot succeed. And they are not likely to feel that they can succeed unless they have previously experienced success, along with the support needed to achieve that success.

These findings suggest that the earlier schools and teachers begin to build students' confidence in their ability to do well, the better off students will be. Because students' notions of their capacity to be successful are so important to engagement in school and learning, school contexts should be designed in ways that support feelings of success. This study found that two factors in the school context — supportive teachers and clear and high expectations about behavior — were key to enhancing the development of both perceived competence and engagement. Teachers whom students see as supportive and who set clear rules and guidelines about

behavior help create an atmosphere in which students feel in control and confident about their ability to succeed in future educational endeavors.

The study also makes the case that student engagement is enhanced by learning activities that involve student-to-student interaction. Other research suggests that challenging and attainable academic goals, teaching strategies that emphasize student collaboration, and subject matter that is meaningful and connected to students' experiences also contribute to their feelings of academic competence and engagement. Teacher training strategies should focus on assisting teachers to create collaborative, supportive environments with high but achievable standards.

It is puzzling that the study discerned so few statistically significant relationships between the measures of high-quality instruction and those of perceived academic competence and engagement in school. It may be that students did not accurately interpret what was happening in their classes. It may also be that the First Things First program had not been in place long enough for students to experience meaningful increases in academic expectations or active and connected learning strategies. There may simply have been too little variation across students' instructional experiences to clearly understand the relationships between teaching strategies and perceived academic competence and engagement in school.

The relationships that did emerge between these constructs tended to be negative (except for collaborative student-to-student interactions). This supports the conclusion that clear and high academic expectations and active and connected learning strategies may not in and of themselves be sufficient to increase students' sense of involvement in learning and their belief that they can do well. If students view academic standards as so high that they are unattainable, they are unlikely to feel that they can be successful, and will be less engaged in schoolwork. Similarly, if students are exposed to active and connected learning strategies without sufficient scaffolding and support, the strategies will have a detrimental influence on their perceived capacity for success and their subsequent engagement in school and learning.

The findings also suggest that the supportive influence of school context may be more immediate than long term. The relationships between supportive relationships with teachers and clear behavioral norms on one hand, and perceived academic competence on the other, were much stronger in the same year than they were across years. Treating students well in the short term, then, may lead them to feel more confident, become more engaged, and learn more. But a positive initial experience is not enough, as the influences fade from one year to the next. To be successful in the long term, students may need supportive teachers and high-quality instruction throughout their high school careers. At the same time, the findings also suggest that an intervention that emphasizes supportive relationships, high and clear expectations, and high-quality instruction can make a difference to students at any point in their educational careers, and that these factors in the school context will produce strong and immediate influences. It is never too late to create high-quality academic environments with positive benefits for students.

Appendix

Survey Items Used to Create Student Attitudes and Behavior Scales and School Context Scales

Construct	Survey Items
Student Attitudes and Behavior Scales	
Student Engagement Scale	• S5: How important is it to you to do the best you can at school? • S8: I pay attention in class. • S39: I often come to class unprepared. • S44: I work very hard on my schoolwork. • S53: I don't try very hard in school.
Student-Perceived Academic Competence Scale	• S14: I can't do well in school. • S18: I can do well in school if I want to. • S16: I don't know what it takes to get good grades in school. • S22: I'm not very smart in school. • S29: I can't work very hard in school. • S35: Trying hard is the best way for me to do well in school. • S41: I don't know how to keep myself from getting bad grades. • S50: I'm pretty smart in school. • S56: I am unlucky in school.
School Context Scales	
Clarity of Expectations	
Teacher Support Scale	• S12: My teachers aren't fair with me. • S17: My teachers like the other kids in my class better than me. ▪ S24: My teachers don't make clear what they expect of me in school. ▪ S28: My teachers interrupt me when I have something to say. ▪ S31: My teachers like to be with me. ▪ S42: My teachers are fair with me. ▪ S47: My teachers' expectations for me are way off base. ▪ S57: My teachers care about how I do in school.
Academic Expectations Scale	• S73: Your teacher makes clear to you how major assignments you're given will be evaluated and graded. • S74: Your teacher makes clear to you how your overall grade will be determined. • S75: Your teacher makes clear to you examples of high-quality work that will lead to high grades. • S76: Your teacher makes clear to you examples of poor-quality work that will lead to low grades. • S77: Your teacher makes clear to you that are expected to come to class prepared. • S78: Your teacher makes clear to you that the work is meant to challenge you. (continued)

Construct	Survey Items
Academic Expectations Scale (continued)	• S79: You are expected to do your very best work all of the time. • S80: You can do good work if you try hard and participate fully in classroom activities. • S81: Your teacher makes clear to you how to figure out specific steps you can take to improve your performance. • S85: You understand exactly what your grade is based on. • S90: Everybody is expected to take part in classroom activities. • S93: It's easy to "tune out" and not take part in class. • S96: All students are expected to work hard during class. • S97: Students can get away with not participating in class as long as they don't make trouble.
Conduct Expectations Scale	• S82: Your teacher makes clear to you how you should behave when working with other students in pairs or small groups. • S83: Your teacher makes clear to you what student conduct is unacceptable. • S84: Your teacher makes clear to you what will happen to students who misbehave. • S7: A lot of students never get recognized for the good work they do. • S13: Students in my school are expected to treat all of the adults in this school with respect all of the time. • S15: The rules in this school are very clear. • S20: Students here get positive recognition when they do well in school. • S21: Students in my school are expected to treat each other with respect all of the time. • S30: All students get a chance to be recognized for the good work they do. • S36: Students get away with a lot in this school. • S52: All adults in this school treat all students the same when it comes to following the rules.
High-Quality Pedagogy	
Active Learning Strategies Scale	• S62: Listen to the teacher lecture for more than half the class period • S63: Work in small groups or pairs • S64: Work individually on exercises from workbooks, texts, or handouts for more than half the period • S65: Participate in discussions that students lead • S66: Discuss and ask each other questions about the work you're doing • S67: Choose your own topics or problems to study • S68: Write essays, themes, poetry, or stories (solve math problems at the board) • S69: Use "real-life" situations in the work you are doing in class • S70: Write up projects you've done in class (continued)

Construct	Survey Items
Active Learning Strategies Scale (continued)	• S71: Work on projects that last several class periods • S72: Work on projects you help design
Student-to-Student Interactions Scale	• S91: Students help each other learn. • S92: Students go over and discuss each other's work. • S94: Individual students speak about their work in front of the class. • S95: When students present their work to the class, other students ask questions and give feedback. • S98: Students review what they've learned with one another.
Making Connections and Extensions Scale	• S58: Learning to find more than one way of approaching a problem or issue • S59: Learning about the various sources of information that can be used for completing assignments and projects • S60: Making connections between what goes on inside and outside of school • S61: Making connections between what's covered in your English/Math class and what's covered in other classes

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