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## Student Engagement in Instructional Activity: Patterns in the Elementary, Middle, and High School Years

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*Although student engagement with the intellectual work of school is important to students' achievement and to their social and cognitive development, studies over a span of two decades have documented low levels of engagement, particularly in the classroom. Examining several theoretical perspectives that attempt to explain engagement through comprehensive frameworks, this study evaluates the effect on engagement of school reform initiatives that are consistent with the theories. The study also investigates whether patterns exist in students' engagement, whether the patterns are consistent across grade levels, and whether class subject matter (mathematics or social studies) differentially affects engagement. The sample includes 3,669 students representing 143 social studies and mathematics classrooms in a nationally selected sample of 24 restructuring elementary, middle, and high schools. Because of the nature of the nested data (students nested within classrooms nested within schools), the analysis is conducted using hierarchical linear modeling in its three-level application (HLM3L). The reform initiatives, which are consistent with the theories, eliminate personal background effects. Together with classroom subject matter, they substantially influence engagement. The results are generally consistent across grade levels.*

Student engagement with school and the intellectual work of learning is an important goal for education (Elmore, 1990). Engagement in the classroom leads to achievement and contributes to students' social and cognitive development (Finn, 1993; Newmann, 1992). Students who are engaged with school are more likely to learn, to find the experience rewarding, to graduate, and to pursue higher education. Despite its importance, research studies over the past two decades have documented low levels of student engagement in U.S. schools (Goodlad, 1984; Oakes, 1985; Sizer, 1984; Steinberg, 1996). Much of the research has attributed the lack of engagement to factors in students' personal backgrounds and to characteristics of their schools, including curricular fragmentation, weak instruction, and low expectations for student learning.

Enhancing student engagement persists as a challenge to educators (Sax, Astin, Korn, & Mahoney 1997; Steinberg, 1996). Within such a context, this study examines several theoretical perspectives that attempt to explain student engagement through comprehensive models, specifically the frameworks proposed by Bonfenbrenner (1979), Finn (1989, 1993), and Newmann (1981, 1992). Efforts to increase student engagement have been a theme of school reform over the past decade. To assess their relationship to student engagement in instructional activity, this study examines some reform initiatives that are consistent with the theoretical frameworks. These include offering students challenging and compelling instructional work, providing school and classroom environments supportive of learning, and involving parents with their children's schooling.

Students in elementary, middle, and high schools are the focus of the analysis. By developing identical models for students at all three grade levels, the study investigates whether patterns exist in the engagement of students in instructional activity and whether the patterns are consistent at various stages of schooling. The study also investigates whether differences in the levels of student engagement are attributable to subject areas, namely, mathematics and social studies.

The sample includes 3,669 students representing 143 social studies and mathematics classrooms in a nationally selected sample of elementary, middle, and high schools—eight at each grade level (Newmann et al, 1996). The study draws on surveys completed by the students about themselves, their schools, and their classroom experiences in mathematics or social studies. Because of the nature of the nested data (students nested within classrooms nested within schools), the analysis is conducted using hierarchical linear modeling (HLM) in its three-level application (Bryk & Raudenbush, 1992; Bryk, Raudenbush, & Congdon, 1996).

## **Background**

### **Student Engagement and Its Importance**

Focusing on student engagement in relation to classroom instruction, this study conceptualizes engagement as a psychological process, specifically,

the attention, interest, investment, and effort students expend in the work of learning. Defined in this way, engagement implies both affective and behavioral participation in the learning experience. The conception is consistent with other researchers' definitions of engagement: students' "involvement with school" (Finn, 1989, 1993); their "psychological investment in and effort directed toward learning, understanding, or mastering the knowledge, skills, or crafts that academic work is intended to promote" (Newmann, Wehlage, & Lamborn, 1992, p. 12); and students' "interest" and "emotional involvement" with school, including their "motivation to learn" (Steinberg, 1996). Engagement is an important facet of students' school experience because of its logical relationship to achievement and to optimal human development.

Although research examining the effect of engagement on achievement is comparatively sparse, existing studies consistently demonstrate a strong positive relationship between engagement and performance across diverse populations (Finn, 1989, 1993; Finn & Rock, 1997). Nonetheless, the process of disengagement can begin in the early school years if students do not fit in, participate, and succeed (Finn, 1989). Lack of engagement adversely affects student achievement and initiates a downward spiral that may lead to dysfunctional school behavior and, ultimately, culminate in some students leaving school entirely (Finn, 1989; Newmann, 1981, 1992; Steinberg, 1996; Wehlage, Rutter, Smith, Lesko, & Fernandez, 1989).

Developmentally, engagement is a growth-producing activity through which the individual allocates attention in active response to the environment (Csikszentmihalyi, 1990). Children learn by paying attention to other people, events, and aspects of their surroundings that they find meaningful and enjoyable (Bonfenbrenner, 1979). Through the process of socialization, they learn to concentrate on tasks. Cognitively challenging tasks and verbal interactions around these activities promote their intellectual development. How children and adolescents choose to allocate their attention depends on the interaction of several factors: their natural inclinations, the satisfaction they have derived from paying attention in other settings, and the value they attach to the activity based on its relevance to a future they anticipate (Csikszentmihalyi, 1990). As developing persons mature, nonroutine and substantively complex work in which they can exercise self-direction tends to be most absorbing, pleasurable, and rewarding (Bonfenbrenner, 1979; Csikszentmihalyi, 1984, 1990).

### **The Problem of Student Disengagement**

Student disengagement at school, particularly in the classroom, emerged as a problem in the mid-1980s when researchers presented a troubling picture of the internal organization and culture of comprehensive high schools (Cusick, 1983; Goodlad, 1984; Oakes, 1985; Powell, Farrar, & Cohen, 1985; Sedlak, Wheeler, Pullin, & Cusick, 1986; Sizer, 1984). These studies portrayed dispirited teachers and disengaged students 'putting in their time'

## *Marks*

while negotiating a sprawling and fragmented curriculum. In most of the classrooms, instruction followed the transmission model and induced passivity and boredom among students.

The disengagement portrayed by these researchers is still a pervasive problem, particularly in U.S. secondary schools (Newmann, 1992; Sax et al., 1997; Steinberg, 1996). Chronic disengagement reportedly afflicts 40% to 60% of secondary school students (Sedlak et al., 1986; Steinberg, 1996), an estimate that excludes repeated absentees and dropouts.<sup>1</sup> No comparable estimate of disengagement exists for students in elementary schools. However, critics have indicted these schools for providing meaningless instructional activities that disillusion students about the usefulness of school and for failing to equip them with the skills they need to succeed in later grades (Finn, 1993; Goodlad, 1984; Sedlak et al., 1986).

Although classrooms in which student engagement was high constituted a small segment of those visited by the researchers, such classrooms did exist. When high levels of classroom engagement occurred, observers ascribed it to the uppertrack status of the class, students' self-selection into a program of special interest to them, or, occasionally, teachers' instructional styles, including the expectations they held for students (Oakes, 1985; Powell et al., 1985). Within classrooms, students sometimes varied in their degree of disengagement. Even when the majority of students seemed passive and bored, some students appeared interested and involved, a variation Oakes (1985) attributed to an interplay of personal characteristics, school experience, and treatment in the classroom.

### **Engagement and Student Background**

Most previous research has shown that engagement depends on the personal background of students. At all grade levels in elementary, middle, and high school, girls are consistently more academically engaged than boys (Finn, 1989; Finn & Cox, 1992; Lee & Smith, 1993, 1994). With higher levels of socioeconomic status (SES), engagement among elementary, middle, and high school students is also higher (Finn, 1989; Finn & Cox, 1992; Lee & Smith, 1993, 1994). More academically successful middle and high school students report greater engagement with school and their class work (Lee & Smith, 1993, 1994).

The relationship between minority status and student engagement differs by grade level and SES. Minority elementary school students are less engaged academically in Finn and Cox's (1992) study, but minority and nonminority middle school students do not differ on academic engagement (Lee & Smith, 1993). Minority high school students (in an analysis controlling for engagement during the eighth grade) are more likely to be engaged in their academic work than non-Hispanic White students (Lee & Smith, 1994). However, minority students from low-income homes tend to be disengaged in the classroom (Steele, 1992).

Although much of the research on student engagement has focused primarily on the influence of student background factors, it is important to

expand that inquiry to learn whether schools and families can enhance engagement through particular efforts. One way to approach this is to examine the major theoretical perspectives that explain student engagement through comprehensive frameworks, specifically those proposed by Bronfenbrenner (1979), Finn (1989, 1993), and Newmann (1981, 1992).

## **Theoretical Perspectives on Student Engagement**

### **Linking the Systems of Participation**

Bronfenbrenner (1974, p. 60) has characterized U.S. schools as “one of the most potent breeding grounds of alienation in American society.” He bases his charge on the lack of connections for students among school, family, friends, and work, the “four worlds of childhood” (Bronfenbrenner, 1986, p. 431). Taking an ecological perspective, Bronfenbrenner (1979) situates young persons within a set of systems that influence their development: the *microsystem*, the activities, roles, and relationships within a particular setting; the *mesosystem*, the linkages between two or more settings in which the developing person participates; the *exosystem*, one or more systems in which the developing person does not participate actively, but within which influential events may occur; and the *macrosystem*, the consistency between the larger culture and the foregoing subsystems.

The mesosystem, a system of microsystems that includes peer group, classroom, school, or family, is particularly important in the young person’s experiential framework. For students who have a substantial mesosystem working for them (i.e., it provides support and connects learning and the work of the classroom with other systems in their lives), engagement is more likely to be high. To the extent that students lack a supportive mesosystem, engagement is more likely to be low.

Bronfenbrenner (1979) also underscores the influence on the young person’s development of the “substantive nature” of the ongoing activities in which he or she participates that range in complexity and the capacity to engage. The instructional activities students undertake and experience in school can be judged along such a continuum. More complex and cognitively challenging class work, according to this theory, has the potential to engage students more deeply. Overall, however, schooling fails as a developmental context. Bronfenbrenner specifically laments that students do not do “real” work (i.e., work another actually depends on) and do not participate in a “curriculum for caring” (i.e., giving care in the community).

### **Providing Social Support and Authentic Work**

Focusing on the problem of student alienation, Newmann (1981, 1989a, 1989b) locates the sources of student disengagement in alienating characteristics of bureaucratically organized schools, namely, meaningless, low-level school work and impersonal relationships with teachers and other

## *Marks*

students. Building on this earlier work, Newmann et al. (1992) articulate a theory of student academic engagement that draws on the sociological theory of Merton (1968) and the psychological theory of Connell (1989). The researchers propose three bases for student academic engagement: (1) the fundamental human need to develop and express competence, (2) school membership, and (3) authentic academic work.

Because the need for competence is generally inherent, most students begin their school careers motivated to learn. For many students, however, their experience of school dulls that motivation or even suppresses it entirely. For these students to become academically engaged would require a reversal of the alienating experiences, a sense of membership in school to replace impersonality and isolation and authentic academic work to replace low-level school work (Newmann, 1989a; Newmann et al., 1992). Authentic academic work involves students intellectually in a process of disciplined inquiry to solve meaningful problems, problems with relevance in the world beyond the classroom and of interest to them personally.

### **Creating a Continuum of Developing Participation**

Finn (1989, 1993) has also proposed a model for student engagement. Engagement, according to Finn's conceptualization, is student involvement with school. Affectively, engagement implies a sense of belonging and an acceptance of the goals of schooling. Behaviorally, engagement is a continuum of developing participation (i.e., complying with school and classroom procedures, taking initiative in the classroom, becoming involved in school activities, and ultimately taking part in school governance).

Finn situates engagement within an ongoing cyclical process. Participation leads to academic success, which, in turn, influences identification with school (i.e., the affective dimension of engagement, such as valuing, belonging). Identification increases the likelihood of future engagement. The depiction of engagement as a product of cumulative school experience is a separate dimension within Finn's model (incorporated into the membership dimension in the model proposed by Newmann et al., 1992). By portraying engagement as largely a function of the individual, however, the Finn model omits influences from organizational environments, except for instruction.

### **Student Engagement: An Issue in School Reform**

Because of its logical relationship to achievement and its worth as an end in itself, student engagement with schooling and academic work emerged as a valued student outcome for school reform (Elmore et al., 1990; Murphy, 1991; Newmann, 1991a). To promote engagement and achievement, reformers have proposed an array of innovations that are generally consistent with the theories discussed above and designed to reshape how students experience school. Some schools, as part of their reform efforts, have begun to provide students with more socially supportive school environments, including multiyear advisory groups and schools-within-schools (Conley, 1993). In

some schools, instruction as the transmission of information has led to an emphasis on the active involvement of students in more challenging and interesting work, accenting the construction of knowledge (Leinhardt, 1992; Newmann et al., 1996; Newmann & Wehlage, 1993). Because the investment of parents' interest and energy in their children's education has a positive effect on academic performance (Muller, 1993; Stevenson & Stigler, 1992), many schools are making systematic efforts to involve parents with student learning as well as in school activities and governance (Newmann, 1991b). Because the expectations of schools and teachers directly influence how well students achieve, schools involved with reform often strive to strengthen their commitment to equity in the delivery of instruction, a policy that may encourage greater student engagement (Secada, Gamoran, & Weinstein, 1996).

Previous research suggests that these reforms are a step in the right direction. The extent of support for learning that students receive from the groups to which they belong influences their engagement in the classroom (Brown, 1993; Cusick, 1991; Lamborn, Brown, Mounts, & Steinberg, 1992). Although levels of engagement do not vary between the elementary school social studies and mathematics classes studied by Stodolsky (1988), students in both subject areas are the most engaged by instruction that is cognitively challenging. Moreover, when classroom work in mathematics and social studies is cognitively involving, no social class differences in engagement are present among elementary school students (Stodolsky, 1988). In Nystrand and Gamoran's (1991) study of eighth-grade English classes, high levels of procedural engagement exist but with little substantive engagement. When substantive engagement does occur, teachers have posed open-ended questions, incorporated student responses into further questions, and built discussion around the ideas the exchange generated (Nystrand & Gamoran, 1991).

### **Conceptual Framework and Research Questions**

Drawing on sometimes overlapping elements from the Bronfenbrenner (1979), Finn (1989, 1993), and Newmann et al. (1992) models, this study proposes to apply elements central to these models to investigate engagement among elementary, middle, and high school students. Specifically, from the Bronfenbrenner model, the study takes the ecological concept of support derived from system linkages. From the model Newmann and colleagues have proposed, the study takes the concept of authentic instructional work (an idea also suggested by Bronfenbrenner). From the Finn model, the study takes the notion of orientation toward school (i.e., previous school experience) as contributing to present engagement (a notion also suggested by Newmann and colleagues).

Thus, three major research questions guide this study: (1) To what extent do personal background and orientation toward school (when personal background is taken into account) contribute to students' engagement



## *Marks*

in instructional activity? How consistent are the estimated influences on engagement for students in elementary, middle, and high schools? (2) To what extent do school initiatives to improve students' learning (namely, providing authentic instructional work, providing a socially supportive environment for learning, involving parents with their children's schooling) counter the influence of personal background and orientation toward school on students' engagement in instructional activity? To what extent are the estimated influences on engagement consistent for students in elementary, middle, and high schools? (3) How influential is the subject matter of the class (mathematics compared with social studies) on students' engagement in instructional activity?

## **Method**

### **Sample**

Because the majority of schools have not undertaken the substantial changes theorists have suggested as important to student engagement, a random sample of schools would be inadequate to conduct the study. In addition to providing data to make the constructs proposed by the engagement theorists operational, the ideal sample would need to include students at various stages of schooling in elementary, middle, and high schools. Data meeting both these criteria were collected by the Center on the Organization and Restructuring of Schools during 1991–1994 and used to study school restructuring in the United States. The Center studied 24 schools (8 elementary, 8 middle, and 8 high schools) selected through a national search for schools that had made substantial progress in restructuring (Berends & King, 1994; Newmann et al., 1996).

To investigate engagement in instructional activity, this study concentrates on a portion of the sample, that is, students in Grades 5, 8, and 10 from six core classrooms (three mathematics and three social studies) in each of the 24 schools. Participating schools selected the core classrooms in each subject area according to two criteria specified by the Center: "At least one core teacher in each subject area is involved in the school's effort to restructure student experiences and ... the three classes reflect the range of student achievement within the grade as a whole (Center for the Organization and Restructuring of Schools, 1992).

### **Data**

Students responded to survey items about their attitudes, behaviors, and experiences in either a target mathematics or social studies class, about their experience in school more generally, and about their personal and family background.<sup>2</sup> The survey response rates were quite high and the representation of students by grade level and subject area is fairly well balanced. More than 3,660 students in 143 of the 149 core classrooms completed

*Student Engagement in Instructional Activity*

*Table 1*  
**Definition of the Analytic Sample**

	Mathematics	Social studies	Combined
Schools			
Elementary	8	8	8
Middle	8	8	8
High	8	8	8
Total	24	24	24
Classrooms			
Elementary	24	24	48
Middle	23	23	46
High	24	25	49
Total	71	72	143
Students			
Elementary	688	660	1,348
Middle	535	616	1,151
High	542	628	1,170
Total	1,765	1,904	3,669

surveys, an average of 26 students per class.<sup>3</sup> The item response rate for completed student surveys was 96%.

Table 1 displays the analytical sample for this investigation. Mathematics and social studies classrooms are equally represented at all grade levels. Except for elementary schools, where the number of students in social studies classes is less than the number of students in mathematics classes, social studies classes in middle and high schools enroll more students (1,904 vs. 1,765). Overall, the elementary students outnumber their counterparts in middle and high school by about 175 students at each level.

### **Restructuring School Sample and the Universe of U.S. Public Schools**

Compared with the universe of U.S. public schools on a set of such typical statistics as size, social class, and minority enrollment, the restructuring schools in this sample are larger, averaging 777 students versus a national average of 522. The restructuring schools enroll more African American and Hispanic students: 20.6% African American students versus 16.3% nationally and 21.7% Hispanic students versus 11.8% nationally. A substantial portion of the sample is poor, averaging 37% of students receiving federal lunch subsidy, but is less than the 56% national rate (J. Derr, personal communication, October 12, 1994).

Disaggregated by grade level, some restructuring school differences from the comparable level in the universe of public schools are especially pronounced. The restructuring elementary schools, for example, enroll three times as many Hispanic students as other U.S. public elementary schools (41% vs. 13.5%). The restructuring high schools enroll more than twice as

## Marks

many African American students as other U.S. public high schools (34% vs. 15%).<sup>4</sup> Unlike the elementary and high schools in the restructuring sample, which enroll more minority students than their national counterparts, the restructuring middle schools enroll 5% fewer African Americans and 2% fewer Hispanics.

The Center for the Organization and Restructuring of Schools (1992) collected ability measures on the students in the core classes, that is, baseline tests using selected items from the National Assessment of Educational Progress (NAEP) reading and mathematics test and a center-designed writing test scored using the NAEP system. This enabled student ability to be compared to a national sample. These comparisons also vary by grade level. The elementary schools are at the national average in mathematics and are slightly above average in reading.<sup>5</sup> The middle schools rank well above the national average, especially in mathematics. The high schools fall considerably below the national average in mathematics and even more so in reading. The low scores in the high schools may be attributable, at least partially, to the discrepancy between the normed grade level for the high school test items (Grade 12) and the grade level of the students taking the test (Grade 10).

## Measures

*Dependent variables.* Student engagement in instructional activity is constructed as a factor containing four component measures: student effort (In social studies/ mathematics class, how often do you try as hard as you can?); attentiveness (How often do you pay attention in this class?); lack of boredom in class (Often I feel bored in this class, [reversed]); and completing class assignments (About how often do you complete your assignments for this class?). The internal consistency of this measure (Cronbach's alpha) is .69. Engagement as perceived and reported by students is substantially correlated with the level of engagement observed in the classrooms of these same students by researchers at the Center for the Organization and Restructuring of Schools (1992),  $r = .374$ .<sup>6</sup> By providing a complementary objective assessment of classroom engagement levels, the observers' report validates the more subjective student rating. (Appendix A contains additional details on the dependent measure and all other variables incorporated in the investigation.)

*Independent variables.* Personal background measures include gender (female), a dummy-coded variable (1 = Female; 0 = Male); race (African American) and ethnicity (Hispanic), each a dummy-coded variable (1 = African American or Hispanic; 0 = White); SES; and prior achievement. For elementary students, SES is the mean of household items and household features (summed and standardized). For secondary students, SES is the mean of household items and household features and the mean of parental education (summed and standardized). Prior achievement was measured early in the survey year as the student's score on a standardized test using

NAEP items. Students in the mathematics core classes took a mathematics test; students in social studies core classes took a reading test and submitted a writing sample, scored using a NAEP rubric. The social studies achievement score is the mean of the reading and writing test scores.

Orientation toward school is represented by two measures: academic success and alienation. Academic success is operationalized by student grade point average in English, science, mathematics, and social studies. For elementary school students, alienation is measured as the mean of two standardized items: the frequency (during the year of the survey) with which a student was late for school and the frequency with which a student got into trouble for not following school rules. For middle and high school students, the measure of alienation also includes the frequency with which a student cut or skipped classes, was put on in-school suspension, or was put on probation or suspended from school.

Authentic instructional work, constructed as a factor, consists of four component measures relating to the frequency with which the student is involved in meaningful academic experiences in the core mathematics or social studies class: (a) you are asked interesting questions and solve new problems, (b) you dig deeply into understanding a single topic, (c) you apply the subject to problems and situations in life outside of school, (d) you discuss your ideas about the subject with the teacher or students.<sup>7</sup>

Forms of social support for learning are operational in three measures: (1) school support for learning, the mean of its standardized components, incorporates five items tapping students' school experience—whether they are put down by other students (reversed), do not feel safe at school (reversed), find that disruptions by other students get in the way of their learning (reversed), believe most teachers really listen to what they have to say, and believe that they (and friends) are treated fairly; (2) classroom support, a factor, reflects a combination of high expectations for achievement and help for learning from teachers and peers; and (3) parental support is constructed as an index. For elementary students, the index is the mean of two factors, parental involvement at school and the frequency of discussion between students and their parents on academic matters. For secondary school students, the index includes a third factor, the frequency with which students discuss their school program and college plans with their parents, including taking the Scholastic Aptitude Test (SAT) or American College Testing Program (ACT) examinations.

To investigate potential differential effects of disciplinary content on student engagement, the analysis includes an indicator of subject area. Classroom subject matter is a dummy-coded variable (1 = Math; 0 = Social Studies).

### **Analytical Approach**

The initial set of analyses examines observed mean differences on the modeled constructs by subject area and grade level. The examination employs

two-way analysis of variance (ANOVA), which permits the simultaneous evaluation of the main effects (subject and level) and the possible interaction of these effects (Subject  $\times$  Level).

The multivariate analyses involve a hierarchical data structure with three levels of random variation, that is, students nested in classrooms and classrooms nested in schools. The appropriate analytical technique is multilevel, HLM in its three-level application (HLM/3L; Bryk & Raudenbush, 1992; Bryk et al., 1996). HLM/3L partitions the variance in the dependent variable (engagement) among three component levels, that is, students, classrooms, and schools. The HLM/3L analysis, accordingly, employs three equations: (a) a within-classroom student model that explains variation in the outcome for each student as a function of individual characteristics and a random student-level effect, (b) a classroom-level model that explains variation in the student-level coefficients as a function of the differing characteristics of classrooms and a random effect, and (c) a school-level model that explains variation in classroom-level relationships as a function of school effects and a school-level random effect.

The HLM/3L analyses for this investigation begin with an unconditional model (i.e., a model with no predictors at the student, classroom, or school levels) that estimates how much variability in student engagement exists at each level and is potentially explainable by the analyses. The analysis of the unconditional model is conducted separately for elementary, middle, and high school students. Unlike much research employing HLM primarily to explain between-group differences, this investigation is aimed equally at explaining within-group variation in engagement (specifically, within classrooms in terms of students' personal background, orientation toward school, their experience of authentic work, and forms of social support). Thus, the within-classroom HLM/3L model provides parameter estimates of the structural relationships hypothesized to influence engagement.<sup>8</sup> The between-classroom model, adjusted for within-classroom differences and for random between-classroom effects, investigates whether average student engagement is higher in some classrooms than in others as a function of classroom subject area. The HLM/3L analyses are conducted separately for elementary, middle, and high schools, with no predictors modeled at the school level. (Appendix B contains descriptions of the HLM/3L fully unconditional and conditional models.)

## Results

### Descriptive Analyses

*Grade-Level Differences.* Engagement in academic work, unadjusted for any other influences, is lower as grade level increases (Table 2). Overall, students in mathematics classes report greater engagement than their peers in social studies, but the significant Subject  $\times$  Level interaction indicates that

*Table 2*  
**Profile of Elementary, Middle, and High School Students in Mathematics and Social Studies Classrooms:  
 A Two-Way Analysis of Variance With Interactions**

Variables	Level			Subject			Level x Subject interactions
	Elementary (N = 1,348)	Middle (N = 1,151)	High (N = 1,170)	Mathematics (N = 1,765)	Social studies (N = 1,904)		
Engagement with instructional activity	3.95***	3.80	3.69	3.92***	3.72		*
Personal background							
Percent Female	51.0	53.0	52.0	50.0	53.0		ns
Percent African American	15.0	10.0	31.0***	20.0*	17.0		ns
Percent Hispanic	36.0***	11.0	15.0	21.0	22.0		ns
Socioeconomic status							
Number of household items, features	6.2	6.9***	6.1	6.4	6.4		*
Parents' education level	—	14.9***	13.7	14.2	14.4***		ns
Prior Achievement	61.0***	55.0	51.0	56.0	57.0***		ns
Orientation toward school							
School success (GPA)	3.09	3.13***	2.75	3.01	2.99		ns
Alienation							
Times tardy, broke rules	4.52	4.12	5.28***	4.48	4.79		ns
Times cut class, suspended	—	1.24	3.16***	2.44*	1.95		ns
Authentic instructional work	2.94	2.95	2.92	3.01***	2.86		ns
Social support for learning							
School support	2.87	2.89	2.84	2.89*	2.85		ns
Classroom support	3.21***	3.13	3.11	3.18*	3.13		**
Parental involvement							
Talk school; attend events	8.12	7.89	7.60	7.97	7.81		ns
Talk program; college; SATS	—	2.82	3.29***	3.09	3.03		ns

*Note.* GPA = grade point average; SAT = Scholastic Aptitude Test.  
 ns = not significant. \* $p \leq .05$ . \*\* $p \leq .01$ . \*\*\* $p \leq .001$ .

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the subject area effect varies by grade level. Although students rank almost the same in mathematics engagement, only middle school students rank about equally as high in social studies engagement.

The proportion of African American students is greater in mathematics than in social studies classes, but Hispanic students are equally likely to be in mathematics as in social studies classes. Social class, measured by household items and other household features, is highest for middle school students. The significant Grade Level  $\times$  Subject interaction reflects the higher SES of middle school students in social studies classes compared with their peers in mathematics classes. Parents of middle school students have also attained higher levels of education.

Prior achievement on the standardized NAEP achievement test is highest for elementary school students and, generally, for students in social studies. Measured by their comparatively low level of academic success (grade point average) and their comparatively high level of alienation, high school students report the least positive orientation toward school. Although authentic instructional work does not vary by grade level, it does vary by subject area. Mathematics students report higher levels of authentic work than their peers in social studies.

Forms of social support for learning vary somewhat both by grade level and subject area. Students in mathematics classes are more likely to regard their school environments as supportive. Classroom support, on average, is greatest among elementary school students and among mathematics students. However, the mathematics effect is not consistent over grade levels. Elementary school students report greater levels of classroom support for learning in social studies than in mathematics, whereas middle and high school students report greater support for learning in mathematics. Elementary school students also experience greater parental interest in and involvement with their schooling than do middle and high school students. High school students report more conversations with their parents about their school programs and college preparation plans than do students in middle schools.

## **Multivariate HLM Analyses**

The first of the HLM analyses employs an unconditional model to provide estimates on the distribution of the variance in student engagement within classrooms, between classrooms, and between schools separately for elementary, middle, and high school grade levels. Most of the variance in engagement at all three grade levels occurs within classrooms (Table 3): a low of 84% at the elementary school level, followed by 88% at the middle school level, with a high of 92% at the high school level. Thus, engagement is largely a function of individual student characteristics and experiences. Between-classroom variance is greatest among the elementary school classrooms (12%), followed by 9% among middle school classrooms, 8% among high school classrooms. Very little variation in engagement is present among

Table 3

**Variation in Engagement Among Students, Classrooms, and Schools by Grade Level**

	Dependent variable: engagement <sup>a</sup>		
	Elementary	Middle	High
Percent within classrooms	83.8	88.0	92.0
Percent between classrooms	12.1	8.6	8.0
Percent between schools	4.1	3.3	0.0

<sup>a</sup>Variable standardized ( $M = 0, SD = 1.0$ ).

the sample schools: 4% at the elementary level, 3% at the middle school level, and no between-school variance at the high school level.

**Influences on Engagement: Personal Background and Orientation Toward School (Question 1)**

The first research question sought to estimate the influence of personal background and orientation toward school on students' engagement in instructional activity and, secondly, to determine whether the pattern of influence was consistent across grade levels. Tables 4–6 display these results for elementary, middle, and high school students, respectively. Because all continuous variables modeled in these analyses are standardized, the coefficients represent the deviation unit increase in engagement for a unit increase in the independent variable.

*Personal background.* Across all three grade levels, girls were significantly more engaged in instructional activity than boys (.30, .25, and .28 for girls in elementary, middle, and high schools, respectively, all effects statistically significant,  $p \leq .001$ ). Social class also contributed significantly to the engagement of students at all three grade levels (respectively, .16, .18, and .13, all statistically significant,  $p \leq .001$ ). No racial or ethnic effect on engagement was present at any grade level. Prior achievement influenced engagement significantly among elementary school students (.14,  $p \leq .001$ ), but not among middle or high school students. The personal background model accounts for less than 10% of the within-classroom variance at any grade level: 6.2% for elementary students, 7.8% for middle school students, and 4.3% for high school students.

*Orientation toward school.* Students' orientation toward school as demonstrated in previous school success (grade point average) or alienation (i.e., reflected in lack of compliance with school rules and subsequent sanctions) exerted significant influences—positive for previous success and negative for alienation—on the engagement of students at all three grade levels. Previous school success exerts the largest influence on engagement for high school students (.32,  $p \leq .001$ ), followed by elementary and middle school



*Table 4*  
**Elementary School Student Engagement Effects: Three-Level HLM Analysis**

Models:	Dependent variable: student engagement <sup>a</sup>			
	Personal background	Orientation toward school	Authentic instructional work	Social support
Intercept	-.19	-.14	-.15	-.13
Female	.30***	.17***	.25***	.22***
African American	.10	.16	.06	.10
Hispanic	.13	.10	.10	.10
Prior achievement <sup>a</sup>	.14**	.06	.09	.10
SES <sup>b</sup>	.16***	.10	.12*	.09
School success (GPA) <sup>a</sup>		.28***		
Alienation <sup>a</sup>		-.21***		
Authentic instructional work <sup>a</sup>			.34***	
School support <sup>a</sup>				.19***
Classroom support <sup>a</sup>				.18***
Parental involvement <sup>a</sup>				.13***
Percent within-classroom variance explained	6.2	19.1	18.1	18.3

*Note.* No predictors modeled at the school or classroom levels. HLM = hierarchical linear modeling; GPA = grade point average; SES = socioeconomic status.

<sup>a</sup>Variable standardized ( $M = 0, SD = 1.0$ ) and grand mean centered. The coefficient is specified as fixed.

\* $p \leq .05$ . \*\* $p \leq .01$ . \*\*\* $p \leq .001$ .

students (.28 and .23, respectively,  $p \leq .001$ ). Alienation detracts from engagement to the greatest extent among middle school students (-.32,  $p \leq .001$ ), followed by elementary and high school students (-.21 and -.22, respectively,  $p \leq .001$ ). Moreover, taking orientation toward school into account eliminated the effect on engagement of prior achievement for elementary school students and of SES for elementary and high school students. At all grade levels, the orientation toward school model attenuated the relationship of female gender to engagement by about 40%.

The orientation toward school model, adjusted for students' personal background, explains 19% of the variance in elementary classrooms, 24% in middle school classrooms, and 22% in high school classrooms.

### **Influences on Engagement: Authentic Work and Social Support for Learning (Question 2)**

The second research question focused on the set of student experiences (associated with school reform)—specifically, authentic instructional work and forms of social support for learning. Authentic instructional work measures students' perceptions that the work they are asked to do in mathemat-

Table 5

Middle School Student Engagement Effects: Three-Level HLM Analysis

Models:	Dependent variable: student engagement <sup>a</sup>			
	Personal background	Orientation toward school	Authentic instructional work	Social support
Intercept	-.09	-.06	-.10	-.04
Female	.25***	.15***	.23***	.15***
African American	-.06	-.06	-.07	-.11
Hispanic	-.27	-.22	-.18	-.26
Prior achievement <sup>a</sup>	.12	-.01	.07	.09
SES <sup>a</sup>	.18***	.15***	.13*	.14***
School success (GPA) <sup>a</sup>		.23***		
Alienation <sup>a</sup>		-.32***		
Authentic instructional work <sup>a</sup>			.40***	
School support <sup>a</sup>				.19***
Classroom support <sup>a</sup>				.22***
Parental involvement <sup>a</sup>				.11***
Percent within-classroom variance explained	7.8	24.4	22.1	20.0

Note. No predictors modeled at the school or classroom levels. HLM = hierarchical linear modeling; GPA = grade point average; SES = socioeconomic status.

<sup>a</sup>Variable standardized ( $M = 0$ ,  $SD = 1.0$ ) and grand mean centered. The coefficient is specified as fixed.

\* $p \leq .05$ . \*\* $p \leq .01$ . \*\*\* $p \leq .001$ .

ics or social studies class is cognitively challenging and connected to the world beyond the classroom. Forms of social support for learning pertain to a school environment in which respect for the learner and encouragement of learning are the norm, expectations in the classroom are high, class members help each other learn, and parents are involved with their children’s school and their learning.

*Authentic instructional work.* Authentic instructional work is a powerful contributor to engagement for elementary, middle, and high school students. The effect enlarges somewhat as student grade level is higher (.34, .40, .42, respectively,  $p \leq .001$ ). Authentic instructional work attenuates the effect of personal background on engagement, eliminating the effect of prior achievement for elementary school students and the effect of SES for high school students. The model explains 18% of the variance in engagement among elementary school students, 22% among middle school students, and 21% among high school students.

*Forms of support for learning.* Social support for learning contributes substantially to student engagement at all three grade levels. A positive school environment, defined here as a school culture that supports student learning, benefits engagement for students (.19 for elementary and middle

Table 6

**High School Student Engagement Effects: Three-Level HLM Analysis**

Models:	Dependent variable: student engagement <sup>a</sup>			
	Personal background	Orientation toward school	Authentic instructional work	Social support
Intercept	-.14	-.13	-.11	-.05
Female	.28**	.17**	.26**	.14*
African American	.02	.11	-.06	-.10
Hispanic	.07	.08	.05	.03
Prior achievement <sup>a</sup>	.05	-.05	.02	.07
SES <sup>a</sup>	.13**	.09	.07	.03
School success (GPA) <sup>a</sup>		.32**		
Alienation <sup>a</sup>		-.22**		
Authentic instructional work <sup>a</sup>			.42**	
School support <sup>a</sup>				.18**
Classroom support <sup>a</sup>				.25**
Parental involvement <sup>a</sup>				.19**
Percent within-classroom variance explained	4.3	22.0	21.3	21.8

Note. No predictors modeled at the school or classroom levels. HLM = hierarchical linear modeling; GPA = grade point average; SES = socioeconomic status.

<sup>a</sup>Variable standardized ( $M = 0, SD = 1.0$ ) and grand mean centered. The coefficient is specified as fixed.

\* $p \leq .05$ . \*\* $p \leq .001$ .

schools and .18 for high schools,  $p \leq .001$ ). The contribution of classroom support increases as students progress in school (.18 for elementary students, .22 for middle school students, and .25 for high school students, all statistically significant at  $p \leq .001$ ). Parental involvement supports engagement at all grade levels (.13, .11, and .19, respectively, all statistically significant at  $p \leq .001$ ).

For students at all three grade levels, social support for learning reduces substantially the differential effect of female gender on engagement. Among elementary and middle school students, the forms of social support for learning also account for the effect of prior achievement. Although SES is not a significant factor for the engagement of elementary and high school students in the presence of social support, the effect of social class on engagement persists among middle school students.

The social support forms model accounts for 18%, 20%, and 22% of the variance in student engagement among students in elementary, middle, and high schools.

**Summary**

The pattern of influence on student engagement in instructional activity for all four models is quite similar across grade levels, as is the proportion of

### *Student Engagement in Instructional Activity*

variance explained by the orientation toward school, authentic instructional work, and forms of social support models. Female gender (at all grade levels) contributes positively to engagement, although the effect is attenuated in the orientation toward school and forms of social support models. No racial or ethnic effects on engagement are evident within any of the models at any grade level. SES consistently predicts engagement for middle school students only. For high school students, the SES effect is significant only in the personal background model; for elementary school students, the orientation toward school and forms of social support models account for the effect of SES apparent in the personal background model. Prior achievement is generally not a significant factor in the engagement, except in the personal background model for elementary students.

For students at all grade levels, orientation toward school affects engagement in the expected directions, that is, successful students are more engaged, alienated students less so. Perceiving class work to be authentic and experiencing forms of social support enhance engagement for all students. These separate models predicting student engagement are evaluated simultaneously in the next section as part of the investigation of the influence of subject matter on engagement.

#### **Class Subject Matter and Student Engagement (Question 3)**

Whether student engagement varies across grade levels as a function of class subject matter necessitates a between-classroom HLM analysis. Because classrooms differ as a function of the students within them, the estimation of the effect of class subject matter requires that student differences be taken into account. Thus, the between-classroom model is adjusted for the full within-classroom model, permitting the contribution to engagement of the Level 2 predictor, subject matter, to be the estimated net of the effects of the students in the classrooms. Conducted separately by grade level as were the previous analyses, this analysis incorporates the full within-classroom model.

Except for the positive influences of female gender among elementary and middle school students and social class among middle school students, in the full within-classroom model students' personal background is not a significant factor in their engagement in instructional activity (Table 7). The effect of orientation toward school is generally comparable across grade levels, but a statistically significant difference among the coefficients is evident for alienation. The magnitude of the negative effect for alienation among middle school students is significantly greater than for elementary or high school students.<sup>9</sup> The contributions of the remaining models are comparable for students at all grade levels. Authentic instructional work influences engagement substantially. For students at all three grade levels, school and classroom support for learning contribute to engagement. Parental involvement enhances engagement for elementary and high school students

Table 7

**Full Within-Classroom Engagement Model for Elementary, Middle, and High School Students With Subject Matter Effect Estimated Between Classrooms: Three-Level HLM Analysis**

	Dependent variable: student engagement <sup>a</sup>		
	Elementary	Middle	High
Intercept	-.24*	.00	-.19*
Female	.11*	.10*	.09
African American	.10	-.08	-.04
Hispanic	.06	-.16	.05
Prior achievement <sup>a</sup>	.02	-.05	-.03
SES <sup>a</sup>	.05	.10***	-.00
School success (GPA) <sup>a</sup>	.20***	.19***	.23***
Alienation <sup>a</sup>	-.17***	-.26***	-.18***
Authentic instructional work <sup>a</sup>	.23**	.27***	.24***
School support <sup>a</sup>	.14***	.10***	.11***
Classroom support <sup>a</sup>	.12***	.13***	.17***
Parental involvement <sup>a</sup>	.08***	.06	.11***
Mathematics class	.31***	-.07	.29***
Percent within-classroom variance explained	32.1	22.0	38.6
Percent between classroom variance explained	66.6	55.5	69.0

Note. No predictors modeled at the school or classroom levels. HLM = hierarchical linear modeling; GPA = grade point average; SES = socioeconomic status.

<sup>a</sup>Variable standardized ( $M = 0$ ,  $SD = 1.0$ ) and grand mean centered. The coefficient is specified as fixed.

\* $p \leq .05$ . \*\* $p \leq .01$ . \*\*\* $p \leq .001$ .

but not for middle school students. Based on these findings, we can conclude that the patterns of engagement among students within classrooms at all grade levels are quite consistent. The model is equally applicable for elementary, middle, and high school students.

Class subject matter proves a significant factor in the engagement of both elementary and high school students. Mathematics class, in both instances, increases the engagement of these students substantially (.31 and .29, respectively, statistically significant at  $p \leq .001$ ). Mathematics is no more likely than social studies to engage middle school students.<sup>10</sup>

The model is most explanatory of the variance at the high school level. Among high school students, the within-classroom model explains 39% of the variance and the between-classroom model explains 69%. For elementary school students, the model explains 32% of the variance within classrooms and 67% between classrooms. The model is less explanatory of the variance in engagement among middle school students, accounting for 22% of the variance within classrooms and 56% of the variance between classrooms.

## **Discussion**

The sample of restructuring schools is a unique one. Because these schools were chosen for study from that select group of nominated schools that had made substantial progress in restructuring, they are by definition organizationally quite different from the majority of U.S. public schools. They also differ demographically in that most of them are urban schools, serving large proportions of minority and economically disadvantaged students. Because of the substantial involvement of these schools in restructuring, we can assume that the students who attended them experienced some benefits that their peers nationwide lacked, particularly those in disadvantaged urban settings. This study sought to capitalize on the presence of reforms to evaluate the efficacy of several of them in addressing the problem of student disengagement. The innovations selected for study cohere as elements of school reform, but they are also strongly linked to reflect central elements of engagement theory.

### **Toward a Model for Student Engagement**

The analyses generally confirmed the applicability of the theoretical constructs and the school reform innovations hypothesized to influence student engagement in instructional activity. In terms of the first research question, investigating patterns across grade levels in the relationship of personal background and orientation toward school as predictors of engagement (Finn, 1989, 1993), personal background accounted for little of the variance in engagement among the students. In the full model, only the effects of female gender for elementary and middle school students and social class for middle school students proved significant. At all grade levels, positive orientation toward school, as reflected in school success, solidly predicts engagement; negative orientation, as reflected in alienation, just as solidly predicts disengagement.

The second research question investigated the efficacy of authentic instructional work and forms of social support for learning (in the school, in the classroom, and through parent involvement) in enhancing engagement for students at all grade levels, net of students' personal background. Authentic instructional work contributes strongly to the engagement of all students. Tapping standards of intellectual quality—higher order thinking, depth of knowledge, substantive conversation, and connectedness to the world beyond the classroom—the salience of authentic work stands in contrast to alienating work, portrayed by Bronfenbrenner (1979, 1986) and Newmann and colleagues (1992) as sources of student disengagement. Although the analysis does not directly compare two forms of student work (alienating vs. Authentic), it does imply that more authentic work brings about greater engagement.

With a single exception, all three forms of social support for learning (i.e., elements reflecting the potentially positive influence of the mesosystem

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as hypothesized by Bonfenbrenner and membership as proposed by Newmann and colleagues) evaluated in this study positively and significantly affect the engagement of all students. A positive school environment is favorable to learning by being normed for respect, fairness, safety, and positive communication. Such an environment enhances the engagement of students at all grade levels. Similarly, supportive classroom environments, in which students experience high expectations and receive help from teachers and peers, promote the engagement of all students. Parental involvement with their child's school and learning influences the engagement of elementary and high school students.

Although the personal background characteristics functioned as controls in the investigation of this question, the relative absence of personal background effects on engagement in the presence of authentic work and systems of social support is an important finding. Notably, race and ethnicity did not differentiate the levels of engagement in instructional activity that students experienced in their classrooms. Social class, although a factor in the engagement of middle school students, did not contribute to the engagement of their elementary and high school counterparts. In addition, students' prior achievement did not affect their levels of engagement.

Because most previous research on student engagement has documented the influence of social background, the absence of such effects may be a consequence of the efforts that are being made by restructuring schools on behalf of equity. The finding that girls are more academically involved than boys is consistent with the findings of previous research on engagement. Girls' engagement may reflect a greater concern on their part for academic performance than for boys (Dweck, 1986), perhaps a result of socialization patterns (Maccoby & Jacklin, 1974) or of the differential expectations of teachers (Wilkinson & Marrett, 1985).

The third research question investigated whether the subject matter of the class, mathematics compared to social studies, differentially affects student engagement. The analysis took into account the characteristics of the students in the class, including how authentic they perceived their instructional work to be and the extent of their social support. Mathematics classes promote high levels of engagement among elementary and high school students much more than social studies classes do. However, among middle school students, subject matter makes no difference to their level of engagement.

## **Contribution to Research and Practice**

The focus on student engagement as an outcome of schooling and as an antidote to the ultimate act of disengagement, dropping out, has stimulated an interest in engagement theory. Because engagement with academic work is fundamental to students' social development and intellectual achievement, understanding the structures and processes that influence student engagement is a basis for subsequent research and the formation of policy. By

investigating a model of engagement using a multilevel analytical technique, allocating the variation in engagement to students, classrooms, and schools, this study has added a new piece to the emerging body of literature on student engagement.

*Disciplinary differences.* Mathematics subject matter clearly differentiated elementary and high school classrooms in their average levels of student engagement. Moreover, mathematics also influenced student engagement indirectly through its strong positive relationship to authentic work for students at all grade levels, but especially for middle school students. Perhaps the favorable influence of mathematics on engagement is attributable to the current reform in mathematics education, which has introduced innovative curricular and instructional approaches. Students may also respond positively to mathematics as a “basic subject,” one that is more structured than social studies. Despite some variation, content selection in mathematics classes is typically sequential and predictable (Stodolsky, 1988). Students understand that paying attention to the present lesson increases the chances that they will understand the content of the next lesson.

Moreover, students consider themselves more teacher dependent in mathematics, where the teacher is the “source” of knowledge, compared with social studies, where the teacher is the “elaborator” of knowledge (Stodolsky, Salk, & Glaessner, 1991). Among students at all grade levels, social studies is one of the least liked subjects. It is considered ‘easy’ by high school students and ‘difficult’ by elementary school students (Goodlad, 1984; Stodolsky et al., 1991). Yet, social studies’ inherent link to life outside the classroom has the potential to generate considerable interest among students because of its relevance to their experience. The public evaluation students expect in their mathematics classes, however, might encourage them to greater academic application there than in social studies classes.

Subject matter also conditions the professional practice of teachers (Stodolsky & Grossman, 1992), that is, teachers’ views of knowledge, their instructional approaches, and their goals for students. These dimensions of practice clearly have implications for student engagement. Because mathematics teachers must prepare students for the next level of instruction by ensuring their mastery of present material, they may press harder for student engagement. Mathematics teachers (and students) may also be more vulnerable to the externally imposed pressure of standardized testing (Stodolsky & Grossman, 1992). Students’ perceived dependency on instruction for acquiring mathematics knowledge and the public evaluation that tends to typify mathematics more than social studies classes may also account for their greater engagement in mathematics classes (Stodolsky et al., 1991). Perhaps social studies teachers, in their concern for students’ development of positive attitudes and values as well as social knowledge, press less for students’ engagement in academic work than for students’ demonstration of good human relations and understanding of cultural differences.

*School reform and student engagement.* A key question for research evaluating the effects of restructuring on students’ experience of school is



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whether generalized efforts to improve schools are sufficient to make a qualitative difference in student outcomes, such as engagement and achievement, or whether restructuring requires focused content and strategies to bring about specifically sought results (Newmann, 1992; Wehlage et al., 1989). Students' commitment to academic effort depends on the intellectual substance and quality of instruction, according to the latter theory. The importance of focused, intellectually oriented rationales and content notwithstanding, Lee and Smith (1993, 1994) found that generalized restructuring (i.e., conceptualized as a movement from bureaucratic to communitarian school organization and an increased emphasis on academics) affected the school experience of students in ways that enhanced academic engagement.

Although not refuting the positive influence of generalized restructuring (e.g., organic rather than bureaucratic school organization) on student engagement, this investigation provides support for the importance of intellectual substance and quality in school restructuring initiatives. Within a sample of nationally selected restructuring schools chosen because of significant innovation in student experience and the professional life of teachers, considerable variation exists in student engagement. Specific restructuring content (e.g., authentic instructional work and structures of support for learning) proved important in raising student engagement even where generalized restructuring was taking place.

## APPENDIX A

### Construction of Variables

#### Construct and Components

##### Students

	Range	<i>M</i>	<i>SD</i>
<b>Student Engagement in Instructional Activity</b>			
• In social studies/mathematics class, how often do you try as hard as you can?	1–5	4.4	.94
• How often do you complete your assignments for this class?	1–5	4.2	.89
• How often do you pay attention in this class?	1–5	4.1	.84
• How often do you feel bored in class?	1–5	2.5	.92
Cronbach's $\alpha = .70$ . Composite measure: factor; exponentially transformed and standardized.	-2.5–1.8	0.0	1.0

##### Personal Background

###### (1) Demographic characteristics

• Female gender: Coded female = 1; male = 0	0–1	.51	.50
• African American: Coded African American = 1; Hispanic = 0; White, Other = -1	-1–1	-.27	.75
• Hispanic: Coded Hispanic = 1; African American = 0; White, Other = -1	-1–1	-.23	.70

*Student Engagement in Instructional Activity*

	Range	M	SD
<b>(2) Socioeconomic status</b>			
Household items/features	0–10	6.4	2.5
<i>Secondary students only:</i>			
Parents' Education.	10–18	14.2	2.3
<b>(3) Prior achievement</b>			
<ul style="list-style-type: none"> <li>• For students in math core classes, the score on items from the NAEP math test appropriate to grade level. The score is computed as the ratio of items to total items.</li> </ul>	0–1.0	.48	.50
<ul style="list-style-type: none"> <li>• For students in social studies core classes, the average of the score on items from the NAEP social studies test appropriate to grade level and of the score on a writing sample assessed using NAEP rubrics. The score is computed as the ratio of items correct to total items.</li> </ul>	0–1.0	.57	.15
<b>Orientation Toward School</b>			
<b>(1) Success</b>			
<ul style="list-style-type: none"> <li>• Grade point average in English, social studies, mathematics, and science; mean of four grades.</li> </ul>	.50–4	3.0	.78
<b>(2) Alienation</b>			
<ul style="list-style-type: none"> <li>• I was late for school.</li> </ul>	0–10	2.8	3.3
<ul style="list-style-type: none"> <li>• I got in trouble for not following school rules.</li> </ul>	0–10	1.9	2.9
Cronbach's $\alpha = .33$ . Composite measure: sum of standardized items.	0–10	1.0	
<i>Secondary students only:</i>			
<ul style="list-style-type: none"> <li>• I cut or skipped class.</li> </ul>	0–10	1.4	2.8
<ul style="list-style-type: none"> <li>• I was put on in-school suspension.</li> </ul>	0–10	.5	1.6
<ul style="list-style-type: none"> <li>• I was suspended or put on probation from school.</li> </ul>	0–10	.4	1.4
Cronbach's $\alpha$ (secondary students' items) = .68; combined sets of items, $\alpha = .73$ . Composite measure: mean of summed scales, standardized; logarithmically transformed and standardized.	-1.18–5.80	0.0	1.0
<b>Authentic Instructional Work</b>			
<ul style="list-style-type: none"> <li>• You are asked interesting questions and solve new problems.</li> </ul>	1–4	2.9	.95
<ul style="list-style-type: none"> <li>• You dig deeply into understanding a single topic.</li> </ul>	1–4	3.1	.91
<ul style="list-style-type: none"> <li>• You apply the subject to problems and situations in life outside of school.</li> </ul>	1–4	2.7	1.6
<ul style="list-style-type: none"> <li>• You discuss ideas about the subject with the teacher or students.</li> </ul>	1–4	3.0	1.0
Cronbach's $\alpha = .66$ . Composite measure: factor.	-3.0–1.9	0.0	1.0

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	Range	M	SD
<b>Social Support for Learning</b>			
<b>(1) School</b>			
• In school I often feel “put down” by other students (Rev.).	1–4	2.7	.93
• Most of my teachers really listen to what I have to say.	1–4	3.1	.79
• I don’t feel safe at this school (Rev.).	1–4	3.2	.88
• Disruptions by other students get in the way of my learning (Rev.).	1–4	2.4	.89
• My friends and I are treated fairly in this school.	1–4	3.0	.84
Cronbach’s $\alpha = .51$ . Composite measure: mean of standardized components; exponentially transformed; standardized.			
<b>(2) Classroom</b>			
• The teacher expects me to do my best all the time.	1–4	3.2	.77
• The teacher gives me extra help when I don’t understand something.	1–4	3.4	.79
• My friends and I help each other with our homework.	1–4	2.9	.82
Cronbach’s $\alpha = .40$ . Composite measure: factor.	-2.67–2.04	0.0	1.0
<b>(3) Parental Support for Learning Index</b>			
<b>Since the beginning of the school year, how often did your parent(s), guardian(s), or other family members:</b>			
• Attend a school meeting?	0–2	1.0	.75
• Phone or speak to your teacher or counselor?	0–2	.95	.73
• Attend a school event in which you participated?	0–2	1.1	.80
• Act as a volunteer at your school?			
<b>Since the beginning of this school year, how often have you or your parent(s), guardian(s), or other family members discussed:</b>			
• School activities or events of interest to you?	0–2	1.3	.67
• Things you have studied in class?	0–2	1.3	.66
• Your grades?	0–2	1.6	.61
• Transferring to another school?	0–2	.48	.70
Cronbach’s $\alpha = .66$ . Composite measure: sum of eight components.	0–16	7.9	3.0
<i>Secondary students only:</i>			
• Selecting courses or programs at school.	0–2	1.1	.69
• Plans and preparation for ACT or SAT tests.	0–2	.59	.71
• Going to college.	0–2	1.4	.73
Cronbach’s $\alpha = .59$ . Composite measure: sum of three items. Cronbach’s $\alpha$ for all parent items = .73. Composite measure: (secondary students) mean of standardized scales; standardized.	-2.8–2.5	0.0	1.0

	Range	M	SD
<b>Classrooms</b>			
<b>Subject Area</b>			
Mathematics: Coded mathematics = 1; social studies = 0	0–1	.5	.5

## APPENDIX B

### HLM/3L Unconditional Models

At the *student level*, HLM/3L models engagement for each student as a function of the classroom mean and a random effect:

$$Y_{ijk} = \pi_{0jk} + e_{ijk}$$

where  $Y_{ijk}$  is the engagement of student  $i$  in classroom  $j$  in school  $k$ ;  $\pi_{0j}$  is the mean engagement in classroom  $j$  in school  $k$ ; and  $e_{ijk}$  is the random student effect, that is, the deviation from average classroom engagement for student  $ijk$ . The random student effects are assumed to have a mean of 0 and variance  $\sigma^2$ .

In the *classroom level* model, the classroom mean engagement,  $\pi_{0j}$ , is an outcome that varies randomly around the school mean engagement:

$$\pi_{0jk} = \beta_{00k} + r_{0jk}$$

where  $\beta_{00k}$  is the mean engagement in school  $k$  and  $r_{0jk}$  is a random classroom effect, the deviation of mean engagement for classroom  $jk$  from the school mean engagement. The random classroom effects are assumed to have a mean of 0 and variance  $\tau_\pi$ .

In the *school level* model, school mean engagement varies randomly around the grand mean:

$$\beta_{00k} = \gamma_{000} + u_{00k}$$

where  $\gamma_{000}$  represents the grand mean for engagement;  $u_{00k}$  represents a school effect, the deviation of mean engagement in school  $k$  from the grand mean. The random school effects are assumed to have a mean of 0 and variance  $\tau_\beta$ .

### HLM/3L Conditional Models

The *student level* model represents student engagement as a function of student characteristics and a random error term:

$$Y_{ijk} = \pi_{0jk} + \pi_{1j}\alpha_{1ijk} + \pi_{2j}\alpha_{2ijk} + \dots + \pi_{pj}\alpha_{pijk} + e_{ijk}$$

where  $Y_{ijk}$  is the engagement of student  $i$  in classroom  $j$  in school  $k$ ;  $\pi_{0jk}$  is the intercept for classroom  $j$  in school  $k$ ;  $\alpha_{pijk}$  are the attributes of students hypothesized to influence engagement;  $\pi_{pj}$  are the coefficients expressing the magnitude and direction of the relationship between each student attribute ( $\alpha_p$ ) and engagement in classroom  $jk$ ;  $e_{ijk}$  is the random effect expressing the deviation of student  $ijk$ 's score on engagement from the average class score.

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The *classroom level* model represents the relationship between class-level predictors and student engagement:

$$\pi_{pjk} = \beta_{p0k} + \beta_{p1k}X_{1jk} + \beta_{p2k}X_{2jk} + \dots + \beta_{pqk}X_{qjk} + r_{pjk}$$

where  $\beta_{p0k}$  is the intercept for school  $k$  in the model for classroom effect  $\pi_{pjk}$ ;  $X_{qjk}$  is a classroom characteristic (e.g., mathematics class) predicting  $\pi_{pjk}$ ;  $\beta_{pqk}$  are the coefficients expressing the magnitude and direction of the relationship between  $X_{qjk}$  and  $\pi_{pjk}$ ;  $r_{pjk}$  is a Level 2 random effect expressing the deviation of classroom  $jk$ 's Level 1 coefficient,  $\pi_{pjk}$ , from the classroom-level model predicted value.

Similarly, the *school-level* model represents the relationship between school effects and the Level 2 coefficients,  $\beta_{pqk}$ , which become outcomes in the school-level model:

$$\beta_{pqk} = \gamma_{pq0} + \gamma_{pq1}W_{1k} + \gamma_{pq2}W_{2k} + \dots + \gamma_{pqS}W_{Sk} + U_{pqk}$$

where  $\gamma_{pq0}$  is the Level 3 intercept for  $\beta_{pqk}$ ;  $W_{sk}$  is a school characteristic that is a Level 3 predictor;  $\gamma_{pqS}$  are the Level 3 coefficients expressing the magnitude and direction of the relationship between  $W_{sk}$  and  $\beta_{pqk}$ ;  $U_{pqk}$  is the Level 3 random effect, expressing the deviation of the coefficient  $\beta_{pqk}$  for school  $k$  from the school-level predicted value.

## Notes

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<sup>1</sup>In the 1980s, the dropout rate was especially high for minority students. The dropout rate during the decade ranged from 10% to 13% for Caucasian students, from 16% to 24% for African Americans, and from 28% to 44% for Hispanics (National Center for Education Statistics, 1993). In some central city high schools, over one half the students drop out before graduation (Bryk & Thum, 1989).

<sup>2</sup>The elementary student survey is an abbreviated version of the survey administered to secondary (middle and high school) students. Most items on the elementary school survey have an identical counterpart item on the secondary school survey. In some instances, however, the range of response options differs for the two levels. When such differences occur, the item is rescaled—either through collapsing the item into common categories or standardizing the item, first on its sample (i.e., elementary or secondary)—then restandardized on the entire sample.

<sup>3</sup>Because of a scheduling innovation, one of the restructuring schools in the sample provided 11 core classes for the study. Because only one of the core classes observed during the fall visit continued into the winter trimester (when the majority of the original core students were involved in an internship program), five new core classes were added (two social studies, three mathematics). Although their students and sometimes their class titles changed, the core teachers themselves remained the same for both semesters. Thus, although the study involves 144 core teachers, the total number of core classes is actually 149.

<sup>4</sup>The larger overrepresentation of Hispanic students at the elementary school level and of African American students at the high school level is influenced considerably by the

## Student Engagement in Instructional Activity

almost total minority populations of two of the elementary schools and one of the high schools.

<sup>5</sup>Because the center assigned its own topic for student writing and evaluated the writing sample using its own norms for scoring, the writing scores of the restructuring schools are not appropriately comparable to the scores of the NAEP sample.

<sup>6</sup>Criteria for measuring observed engagement ranged from its lack (i.e., disruptive disengagement) to its full expression (i.e., all or almost all students seriously involved in the substance of the lesson throughout the class). Being on-task, paying attention, doing the assigned work, exhibiting interest, taking initiative, and interacting cooperatively with others in classroom activities signaled engagement to the observers (Center on Organization and Restructuring of Schools, 1992).

<sup>7</sup>Each of these items corresponds to a standard of authentic instruction on which observers rated the core classes. Students' reports of being asked interesting questions and solving new problems correspond to observed higher-order thinking; digging deeply into understanding a single topic, to observed depth of knowledge; applying the subject to problems and situations in life outside of school, to observed connectedness; discussing ideas about the subject with the teacher or other students, to observed substantive conversation. The correlations between student reports of authentic instructional activity and observed authentic instruction are statistically significant: for higher-order thinking,  $r = .232$ ; for depth,  $r = .270$ ; for connection to the world beyond the classroom,  $r = .146$ ; for substantive conversation,  $r = .272$ . The correlations are computed from student reports of instruction aggregated to the classroom level in relation to the average rating of observed instruction over four time points.

<sup>8</sup>For these analyses, the continuous independent variables are centered around the grand mean. All of the independent variables are, in HLM terminology, fixed, that is, the slopes do not vary randomly between classrooms.

<sup>9</sup>The differences between coefficients for the grade levels tested for statistical significance using the following formula:  $T \text{ difference} = (b_{\text{lev}1} - b_{\text{lev}2}) / [(s.e.b_{\text{lev}1})^2 + (s.e.b_{\text{lev}2})^2]^{1/2}$ .

<sup>10</sup>The quality of pedagogy in these mathematics and social studies classrooms did not directly influence student engagement in instructional activity. However, pedagogical quality did demonstrate an indirect effect on engagement through its significant positive relationship to authentic student work.

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